Province of British Columbia
Ministry of Forests
and Lands

F. S. 189 (1) INF 83/5

SPRINGER CREEK
INTEGRATED WATERSHED MANAGEMENT PLAN

MINISTRY OF ENVIRONMENT AND PARKS
WATER MANAGEMENT BRANCH
KOOTENAY REGION

MINISTRY OF FORESTS AND LANDS
ARROW FOREST DISTRICT

EFFECTIVE DATE AND TERM OF THE SPRINGER CREEK
INTEGRATED WATERSHED MANAGEMENT PLAN

1. The Springer Creek IwMP becomes effective on the date of signature by the approving agencies: the Regional Director, Ministry of Environment and Parks, and the District Manager, Arrow Forest District.

2. Amendment of the Springer Creek IwMP may be effected by mutual consent of the approving agencies in consultation with licensed resource users, the Technical Review Committee and/or other affected parties.

3. The Springer Creek IwMP will expire on January 31, 2007 or may be terminated or extended by mutual consent of the approving agencies in consultation with licensed resource users, the Technical Review Committee and/or other affected parties.

APPROVED

K. E. Arnett
District Manager
Arrow Forest District
Ministry of Forests and Lands

ARROVED

D. McDonald
Regional Director
Ministry of Environment and Parks
Kootenay Region

Date: May 29/97

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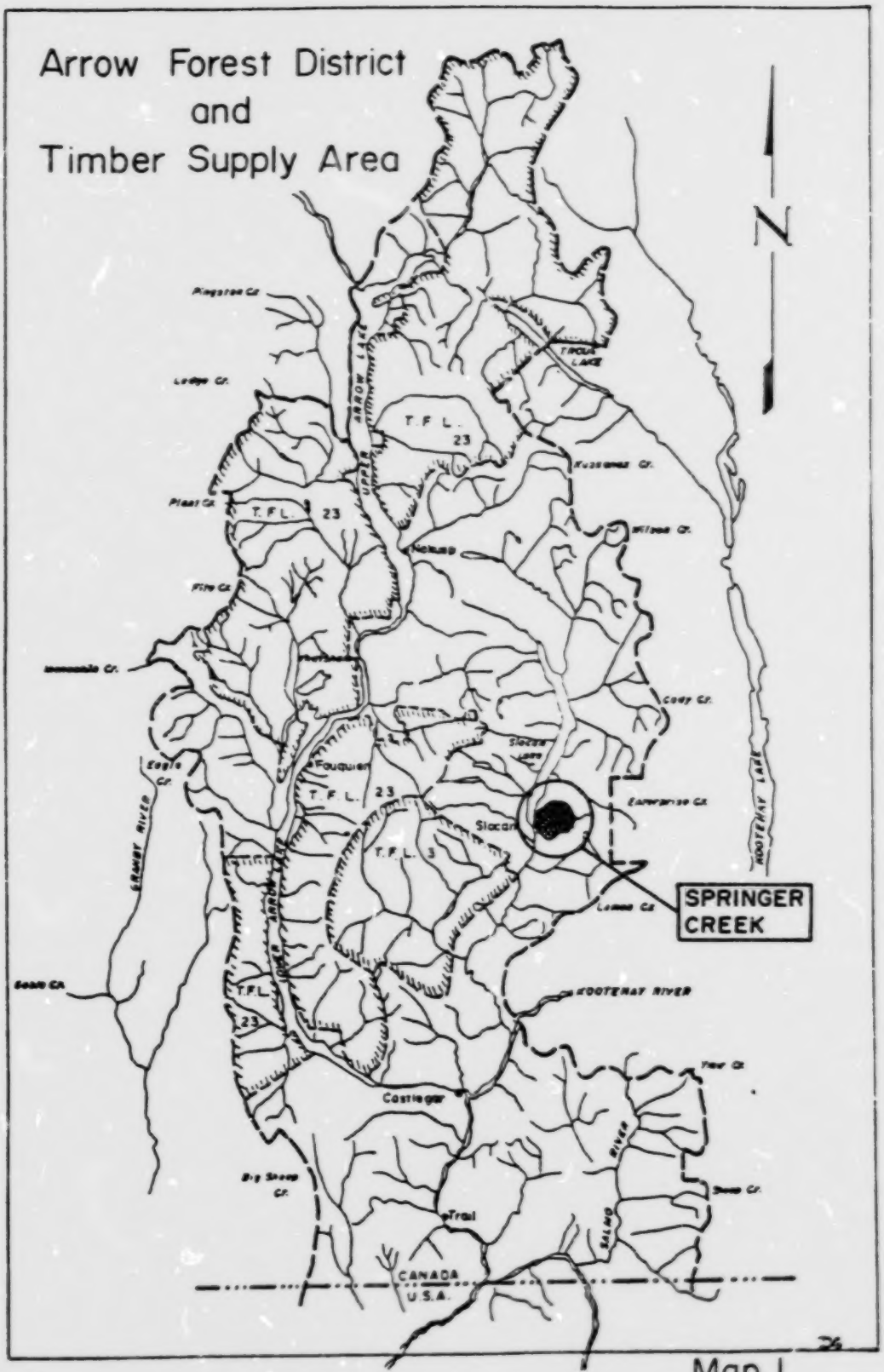
Arrow Forest District
and
Timber Supply Area
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Fauquier
Slocan
SPRINGER CREEK
KOOTENAY RIVER
Castlegar
Trail
CANADA
U.S.A.

Map 1

SPRINGER CREEK INTEGRATED WATERSHED MANAGEMENT PLAN

PREFACE

Over the past decade, public policy in British Columbia has become increasingly preoccupied with new considerations of resource scarcity. The ever-increasing demands by resource users that are being placed on a finite land base result in a total demand that is far in excess of the ability of the land to absorb. As 95% of the land in British Columbia is publicly owned it becomes then, the task of Government to adjudicate an effective mix of resource uses that will optimize social and economic benefit.

Central to the Government response to this task has been an acceptance of the principle of "INTEGRATED RESOURCE USE". This has been defined as "the deliberate and careful planning of the integration of various resource uses to interfere with each other as little as possible and to complement each other as much as possible, giving due regard to the order of importance of each use in a particular area in an attempt to achieve the optimum social and economic benefit to the people of British Columbia"[5].

As the practice of integrated resource use will address issues that vary in degree of complexity and in the actual size of geographic area to be considered, there has evolved different plans and procedures to deal with issue resolution.

In Nov. 1984 the Ministry of Environment and Parks, and the Ministry of Forests and Lands adopted as policy a documented framework for "INTEGRATED WATERSHED MANAGEMENT PLANS" specific to consumptive water supply watersheds. This framework recognizes the importance of such watersheds both as sources of domestic, irrigation and other consumptive use water supplies and as containing stands of timber that are part of the supply needed to support a viable forest industry.

It recognizes too, that "it is generally in the public interest that such watersheds be managed for the production of both water and timber as well as for other natural resources".

Consistent therefore, with this policy the Ministry of Environment Kootenay Region and the Ministry of Forests Arrow District have identified that an INTEGRATED WATERSHED MANAGEMENT PLAN (I.W.M.P.) is required for the Springer Creek drainage and that this plan will be approved by both Ministries prior to the issuance in the watershed, of any further licences or permits.

Summary of Ministry of Forests Plans

PLANS	planning level	planning responsibility	land unit	normal planning scale	normal planning horizon (years)		planning outputs
					detailed period	look-ahead period	
TSA plans TFL M&WPs	Forest Management Planning	Region	TSAs TFLs	1:100,000	20	200	- timber, range & recreation management strategies - AACs for timber
Local plans* (Integrated Watershed Management Plans)	Local Resource Use Planning	District	watersheds, range units, etc.	1:20,000	5	20	- integrated resource management guidelines for designated development areas
timber Development plans range Development plans recreation Development plans	Resource Development Planning	District	five year development areas	1:5,000	5	5	- logistics for resource use development

* Local plans do not follow a standard naming convention. Examples of Local plans are the South Moresby Resource Plan or the Southgate Coordinated Resource Management Plan.

TABLE OF CONTENTS

MAP 1 - Arrow Forest District and Timber Supply Area

Preface

Summary of Ministry of Forests Plans

Plan Goal

Table of Contents

1.0 INTRODUCTION

- 1.1 Area Description
- 1.2 Area Climate
- 1.3 Area History

2.0 PLANNING PROCESS

- 2.1 Plan Area
- 2.2 Plan Implementation and Review
  - 2.21 Technical Review Committee
  - 2.22 Annual Review
  - 2.23 Five Year Review

3.0 SUMMARY OF ISSUES AND CONCERNS

- 3.1 General
- 3.2 Forest Management
- 3.3 Recreation
- 3.4 Mining
- 3.5 Public Highways

4.0 RESOURCES OF THE SPRINGER CREEK WATERSHED

- 4.1 WATER
  - 4.11 Springer Creek
  - 4.12 Climax Creek
  - 4.13 Vincent Creek

4.2 VEGETATION AND TIMBER
4.21 Vegetation
4.22 Timber

4.3 RECREATION

4.4 LANDSCAPE

4.5 SOILS

4.6 FISHERIES

4.7 WILDLIFE

4.8 MINING AND AGGREGATES

5.0 RESOURCE MANAGEMENT OBJECTIVES FOR THE SPRINGER CREEK WATERSHED

5.1 Water Management Objectives
5.2 Forest Management Objectives
5.3 Landscape Management Objectives
5.4 Recreation Objectives
5.5 Fish & Wildlife Objectives
5.6 Mining Objectives

6.0 IMPLEMENTATION TECHNIQUES

6.1 ACCESS
6.11 Planning
6.12 Location
6.13 Design
6.14 Stream Crossings
6.15 Road Drainage
6.16 Road Closures & Deactivation
6.17 Construction
6.18 Road Maintenance
6.19 Slope Stabilization

6.2 HARVESTING
6.21 Cut Block Lay-out
6.22 Buffer Strips
6.23 Skidding
6.24 Post-harvesting Treatment

6.3 STAND MANAGEMENT
6.31 Reforestation
6.32 Fertilization
6.33 Pesticide Use

6.4 PETROLEUM PRODUCTS

6.5 MONITORING AND SUPERVISION

6.6 MINERAL EXPLORATION/AGGREGATE DEVELOPMENT

6.7 FISH & WILDLIFE HABITAT

7.0 CONTINGENCY PLAN FOR RESOURCE DEVELOPMENT IN WATERSHEDS USED FOR DOMESTIC AND IRRIGATION WATER SUPPLIES WITHIN THE SPRINGER CREEK INTEGRATED MANAGEMENT AREA.

7.1 INTRODUCTION

7.2 LIABILITY
- 7.21 Natural Occurrences
- 7.22 Man Induced Impairment

7.3 CONTINGENCY PLAN
- 7.31 Major Participants
- 7.32 Area of Application
- 7.33 Contact Persons
- 7.34 Responsibilities of Participants
  - 7.341 Ministry of Environment, Water Management Branch
  - 7.342 Ministry of Forests
  - 7.343 Licensed Water Users
  - 7.344 Contractors (Forest Licensee, Timber Sale Licensee, Road Construction Contractors, Harvesting Contractors, Miners, Prospectors and other Resource Developers)
  - 7.345 Ministry of Health
  - 7.346 Ministry of Energy Mines & Petroleum Resources

7.4 COURSES OF ACTION
- 7.41 Alternate Water Supply
  - 7.411 Alternative Water Supply for Area "A" (Springer Creek)
  - 7.412 Alternative Water Supplies for Area "B" (Climax, Vincent, Dayton, Silver Bend Creeks)
- 7.42 Specific Responsibilites for Area "A" (Springer Creek)
  - 7.421 Short Term Planned Sedimentation
  - 7.422 Short Term Accidental Sedimentation
  - 7.423 Damage to Intakes
  - 7.424 Plugged Lines
- 7.43 Specific Responsibilities for Area "B" (Climax, Vincent, Dayton, Silver Bend Creeks)
  - 7.431 Short Term Planned Sedimentation
  - 7.432 Short Term Accidental Sedimentation
  - 7.433 Long Term Sedimentation or Pollution
  - 7.434 Plugged Lines
  - 7.435 Damage to Intake
  - 7.436 Long Term Loss of Flour

7.5 PROCEDURE TO ENSURE COMPLIANCE

7.6 DETERMINATION OF RESPONSIBILITY

7.7 CONCLUSION

Contingency Plan Flow Chart For Uuplanned Impairment To Water Supplies

For Unplanned Impairment To Water Supplies Active Operations In Watershed

8.0 PLAN IMPLEMENTATION IMPACTS

8.1 Social/Economic Impact
8.2 Recreation
8.3 Visual Quality
8.4 Forest Management
8.5 Water Quality and Quantity
8.6 Wildlife
8.7 Fisheries
8.8 Access
8.9 Wildfire Suppression
8.10 Risk Analysis

GLOSSARY

REFERENCES

APPENDIX I - Summary of Information Assembled and Considered During the Development of the Springer Creek I.W.M.P.

APPENDIX II - Chronology of Events and Activities for the Development of the Springer Creek I.W.M.P.

APPENDIX III - MOF Procedure for Processing Cutting Permits

APPENDIX IV - LIST OF TABLES

Table I - Implementation Steps for a Systematic Approach to Integrated Watershed Management Planning

Table II - Sub-Unit Harvesting Summary
Table III - Water Licensing Information
Table IV - Harvested Volumes (1980 - 1985)
Table V - Erosion Hazard Chart
Table VI - Silviculture Summary

APPENDIX V - LIST OF MAPS (Attached Inside Back Cover)

Map 2 - Exhibit "A", T.S.H.L. A03449 Cht. 2
Map 3 - Springer Creek Biogeoclimatic Zones
Map 4 - Springer Creek Sub-Units
Map 5 - Springer Creek Environmentally Sensitive Areas
Map 6 - Springer Creek Area Logging Disturbance

SPRINGER CREEK INTEGRATED WATERSHED MANAGEMENT PLAN

PLAN GOAL

The goal of the Springer Creek Integrated Watershed Management Plan is to provide direction for "integrated resource use" in the plan area with the number one priority given to the protection of water quality, quantity and timing of flow, and to specify implementation measures to guide resource activities.

1.0 INTRODUCTION

1.1 AREA DESCRIPTION

Springer Creek enters the Slocan River at the Village of Slocan. The creek drainage, running east to west, encompasses a total area of 5,290 ha and has an elevation range of 518 m.a.s.l. at the delta to 2164 m.a.s.l. at the headwaters. Map 1 locates the drainage within the Arrow Forest District and Timber Supply Area.

Exposures within the watershed are primarily north and south facing though there is some variability due to the number of sub-drainages in the planning unit. Sub-drainages on north facing slopes include Vincent Creek (southwest exposure), Dayton Creek, Coldwell Creek, Tobin Creek, and Bettina Creek. Sub-drainages on south facing slopes include Climax Creek, Scorpion Creek, Algiers Creek, Little Tim Creek and Speculator Creek.

For planning and management purposes, the watershed has been further divided in sub-units. Map 4 and Table II provide information on the location and size of these sub-units.

1.2 AREA CLIMATE[2]

The local climate is a result of the interaction of the mountainous topography of the Cordillera and weather systems from the westerly winds. The area has a continental climate, warm summers and cold winters.

Local climates are affected by latitude, elevation, slope, aspect, distance and direction from other major topographical features.

Changes in slope and aspect influence the amounts of solar radiation received.

Solar radiation is the greatest on south facing slopes which remain unshaded by other topographic features.

Temperatures

- mean daily temperature for January
- min / - 8.7 degrees C (16.3 degrees F) - valley bottom
- max / 0.15 degrees C (31.7 degrees F) - valley bottom

- mean daily temperature for July
- min / 8.3 degrees C (46.9 degrees F)
- max / 27.8 degrees C (82.0 degrees F)

- extreme for January -34.0 degrees C (-29.0 degrees F)
- extreme for July 40.0 degrees C (104.0 degrees F)
- frost free days - Crescent Valley 97
  - South Slocan 140
  - above 6000' less than 30

Precipitation

- dryest - Passmore - 180mm (7.08 in) seasonal
  - 535mm (21.06 in) annual
- increases with elevation
  - 84mm (3.30 in) per 1000' seasonal
  - 235mm (9.25 in) per 1000' annual
- peak rainfall months are May-June and October
- snow fall:
  - up to 25-40% of annual precipitation at lower elevations
  - up to 80% at higher elevations

Winds

Winds are channelled North and South due to the topography. The conditions are considered calm 33% of the time.

Average wind speed is 8.5 km/hour.

1.3 AREA HISTORY

Historically the Springer Creek watershed has been utilized for mineral extraction, timber harvesting and for domestic and industrial water production.

Settlement was the result of mineral exploration commencing in 1893 principally with the claim on Dayton Creek but also including other small claims around Memphis Creek. In 1897, the CPR connected the Village of Slocan with the already existing Robson-Nelson line.

Initial access into the watershed was to facilitate this mining activity. Following the most direct avenue to a given site, these first trails were often located across unstable slopes and through erosion sensitive soils. Subsequent road development along these same locations has further destabilized such sites and has resulted in an almost chronic problem of erosion and sedimentation in the main creek channel. The Ottawa Hill Road is the principal access into the watershed, and is also the principal concern to water quality maintenance or enhancement.

Timber harvesting has increased substantially in the drainage since 1970 largely in response to infestation by Mountain Pine

Beetle. This insect, a most serious enemy of mature pine in western Canada was observed in dramatically increased numbers in various drainages of the Slocan Valley.

Harvesting was authorized to reduce the rate of spread of the infestations and to recover some economic benefit from stands already infested. Activity was predominantly in the tributary drainages of Scorpion, Algiers and Little Tim Creeks and was concentrated in stands having a large component of lodgepole pine. This harvesting has been occurring throughout the Slocan Valley Planning Process. Further information is presented in Tables II, IV and VI.

Springer Creek has been utilized as an alternate domestic water supply by the Village of Slocan since 1956 and as an industrial water supply (mining & milling) since 1893. Further information on water licencing and use of the water resource is provided in Section 4.1.

2.0 PLANNING PROCESS

The Water Management Branch and the Forest Service, as lead agencies, chose "consultation" as the means of effectively achieving the stated goal of the Springer Creek Integrated Watershed Management Plan.

These agencies have conducted an evaluation of the resource base, land use patterns and resource activities and have assessed the requirements for future use of the Crown lands in the Springer Creek, Climax Creek and Vincent Creek watersheds. The Ministry of Energy, Mines and Petroleum Resources and the Ministry of Health have been consulted to advise of their specific concerns. The Village of Slocan, Brandon Waterworks District, the Slocan Valley Watershed Alliance, Slocan Forest Products Ltd. and the public at large have had opportunity to offer comments on the draft plan. Written comments were submitted by the Village of Slocan, Slocan Forest Products Ltd., and the Slocan Valley Watershed Alliance. The Water Management Branch and the Forest Service thoroughly reviewed each of these submissions and incorporated many of their recommendations into the final plan document.

Table I (Appendix IV) outlines the approach taken by the Water Management Branch and the Forest Service to develop the Springer Creek IWMP. These seven implementation steps outline a systematic approach to integrated watershed management planning. In practice, the weighing and considering of the data, the resource use options and the potential impacts necessitate a continual review of some or all of the activities contained in the seven implementation steps. This practice is to ensure that the resulting plan is both effective

and workable. The Water Management Branch and the Forest Service have strived for consensus in the decision making process throughout plan development.

A chronology of the events and activities that have constituted plan development is contained in Appendix II.

The PRODUCT of this planning process is a written report prepared by the lead agencies and entitled the "SPRINGER CREEK INTEGRATED WATERSHED MANAGEMENT PLAN".

This report states the plan goal, outlines information assembly and analysis and describes the measures to be implemented by resource users to protect the water resource. The report also includes a "Contingency Plan" which specifies actions to be taken and outlines responsibilities of all parties should water related problems occur.

Various appendices list the available data used, provide a chronology of activities and events pertinent to plan development and describe the Arrow Forest District procedure for processing cutting permits. A series of maps illustrate key aspects of the resources of the watershed, identify sub-unit planning areas and locate past and proposed harvesting developments. Glossary and reference sections are also included.

2.1 PLAN AREA

The plan area encompasses Springer Creek and its tributaries and includes the adjacent but closely associated smaller drainages of Climax Creek and Vincent Creek.

2.2 PLAN IMPLEMENTATION AND REVIEW

Implementation means that all resource activities proposed for the plan area will be carried out in accordance with the approved Springer Creek IWMP. This will be accomplished by:

- referral of all resource development proposals to various affected government agencies
- notification of potentially affected individual licensed resource users, by the appropriate Ministries, of all proposed resource activities
- review of all resource development proposals by the Technical Review Committee

2.21 Technical Review Committee

A Technical Review Committee shall be established and

may be comprised of representatives from:

Water Management Branch, Kootenay Region
Forest Service, Arrow Forest District
Ministry of Energy, Mines & Petroleum Resources
Ministry of Health
Slocan Forest Products Ltd.
Village of Slocan
Brandon Waterworks District
Licensed water users (individual water licensees not in the Village of Slocan water system or in the Brandon Waterworks system are collectively responsible for designating two representatives)

The purpose of the committee is to assess and to review the Springer Creek IWMP and the respective resource activities for adherence, for problems and for improvements.

The Technical Review Committee shall:

- review the IWMP and all resource use proposals and suggest recommendations to the appropriate Line Managers regarding these proposals, data needs or operating standards

- evaluate past resource activities that have contributed to watershed problems and the measures that had been implemented to mitigate these problems

- investigate solutions to water related problems as outlined in Section 7.6 of the "Contingency Plan"

- participate as a team in reviewing operational plans with the development proponent, conduct field reviews of activities and evaluate activities as they proceed at key stages

2.22 Annual Review

The Forest Service and the Water Management Branch shall jointly conduct and chair the meeting for the annual review.

Participation in the review discussions shall be confined to representatives of the Technical Review Committee members (Section 2.21) and official guests. Other interested parties may attend as observers. Parties wishing to attend the annual review for the

purpose of making a presentation must make arrangements through either the Water Management Branch or the Forest Service, Arrow Forest District.

The committee shall use consensus to reach decisions and shall strive to achieve consensus in all cases. Where an impasse is reached, consultation will be made to the next higher authorization level. (For this plan to the Regional Director Forests and Lands or the Regional Director Environment and Parks.)

2.23 Five Year Review

The Technical Review Committee shall:

- review all resource activities to date
- assess the effectiveness of the plan in accomplishing the stated goals
- recommend appropriate changes to the plan
- participate in a general public meeting jointly conducted and chaired by the Forest Service and Water Management Branch to assess resource activities against the IWMP

3.0 SUMMARY OF ISSUES AND CONCERNS

These concerns represent a synthesis of the many comments and questions by individuals, public groups, government agencies and resource users that have addressed the issue of integrated resource management within consumptive use watersheds in the Arrow Timber Supply Area.

3.1 GENERAL CONCERNS

1. Concern: Government seems to be legally unable to accept liability for damages to private property resulting from resource use on Crown lands of the watershed area.

   Response: the intention of the Provincial Government is to make resource developers, not Government, responsible and liable for damage which they cause to water supplies. Specific responsibilities are stated in the Contingency Plan (Section 7.0).

2. Concern: resource use activities will increase the risk of forest fire in the watershed areas.

   Response: some increase in risk from recreational and industrial use will result. Improved access will enhance

effective response to fires from any source.

3. Concern: the Forest Service and Water Management Branch may not enforce the guidelines for resource activities in the watershed areas.

   Response: the Forest Service and Water Management Branch are committed to effective monitoring and enforcement of contract conditions. The Contingency Plan (Section 7.0) also states responsibilities of major participants in the event of mishap.

4. Concern: there is inadequate attention given to waste disposal resulting from activities in watershed areas.

   Response: sanitation and waste disposal requirements are included in all licences/permits issued by Government resource agencies. These will be monitored and enforced.

5. Concern: there is inadequate monitoring of firewood cutting activities in the watershed areas.

   Response: the Forest Service has neither the staff nor the time to specifically monitor firewood cutting. Monitoring is carried out in conjunction with other activities and firewood permits are required in the Arrow District. The Contingency Plan lists contact persons for reporting potential problems or mishaps.

6. Concern: higher noise levels may be expected during active industrial operations.

   Response: high noise levels will be a short-term problem.

7. Concern: the IWMP for the Springer Creek watershed cannot be fully successful unless the standards of conduct and operation on (undeveloped) private lands are consistent with and compatible with those being established for the Crown lands.

   Response: as a principal water user, the Village of Slocan can encourage compatible development on adjacent private lands.

8. Concern: there is not an effective procedure to deal with recommendations and requests from the public by involved government agencies.

   Response: development of the Springer Creek IWMP has been a vehicle to deal with public concerns; the review process outlined in Section 2.2 provides for continued public

involvement; the Contingency Plan lists contact persons for reporting more immediate problems and concerns.

9. Concern: all tenures authorized under the Mines Act and Forest Act should have provisions that require participation in the Springer Creek IWMP.

   Response: tenures cannot require participation in the IWMP; tenures can and do include conditions to ensure development that is consistent with the plan goal.

10. Concern: there is continual sediment input from identified sediment sources in the Springer Creek watershed area.

    Response: the primary source has been determined to be the existing roads. Forest Service will prepare a map locating all current sources of sediment, will assess ways of rectifying problem sites and will address the question of responsibility.

11. Concern: the lack of procedure in the event of an occurrence that may affect water quality, quantity and timing of flow.

    Response: the IWMP specifies implementation measures for resource activities in the watershed to minimize any impact on water quantity, quality and timing of flow. In the event of a planned or unplanned disruption, the Contingency Plan (Section 7.0) lists the major participants, outlines their responsibilities and specifies courses of action.

12. Concern: will resource extraction benefit the local economy.

    Response: employment through timber harvesting and milling and through mineral extraction provide income which in turn supports local secondary and service enterprises.

3.2 FOREST MANAGEMENT CONCERNS

1. Concern: logging may pose serious risks to the water resources (quality, quantity and timing of flow) of the watersheds.

   Response: the risk of impact on water quality, quantity and timing of flow is minimized by the implementation of the measures stated within the IWMP. In the event of a disruption, planned or unplanned, the Contingency Plan (Section 7.0) lists the principal participants, outlines their responsibilities and specifies courses of action.

2. Concern: logging may pose serious risks to the private properties in the watersheds because of the potential of flood damage from increased spring runoff and fire damage from forest fires originating in logging operations.

   Response: the risk of impact on water quality, quantity and timing of flow is minimized by the implementation of the measures stated within the IWMP. In the event of a disruption, planned or unplanned, the Contingency Plan (Section 7.0) lists the principal participants, outlines their responsibilities and specifies courses of action. In addition, private landowners are encouraged to implement the IWMP recommendations during development of their own properties.

3. Concern: logging may cause damage to the soil resource in the watershed area.

   Response: implementation of measures stated in the IWMP will minimize site disturbance.

4. Concern: logging may negatively impact the visual quality of the watershed areas.

   Response: Visual Quality Objectives for the Slocan Valley have been established in the Slocan Valley Development Guidelines. Visual Landscape management measures will be implemented to minimize the impact on visual quality.

5. Concern: there is not adequate reforestation in the watershed areas.

   Response: site specific reforestation recommendations, outlined in the Licensee Development Plan, must be approved by the Forest Service.

6. Concern: the use of pesticides in the watershed area may present a serious risk of contaminating the water, air and soil.

   Response: Please refer to Section 6.33, Pesticide Use.

7. Concern: road building standards may not always be consistent with the Forest Service and Water Management Branch guidelines that have been specifically designed to make logging more acceptable in community watersheds.

   Response: measures to be implemented during road

construction are stated in the IwMP. Road permits issued by Forest Service for any new construction further specify standards that must be met. Any and all deviations from these guidelines shall be referred to the Technical Review Committee prior to their approval.

8. Concern: newly constructed access roads may not be in a stable condition before hauling begins.

   Response: newly constructed access roads shall be left to stabilize before operational use. The objective is to construct such roads 2 years before they are required for hauling, though, some circumstances may require more immediate use. The Forest Service uses the collective experience of Regional specialists (hydrologists, pedologists, engineers) to recommend design options and suitable structural supports for new access roads.

9. Concern: harvesting activities will increase the spread of noxious weeds.

   Response: the spread of noxious weeds is minimized by seeding disturbed areas (principally roads) with selected seed mix.

10. Concern: there is inadequate monitoring and maintenance of culverts, bridges, and ditches throughout the year in the watershed areas.

    Response: The Forest Service and Slocan Forest Products are committed to frequent inspections during "operations". Further inspections will be less frequent. The Contingency Plan lists Ministry and licensee contacts to notify of potential problems or concerns.

11. Concern: there is inadequate attention to applying good silvicultural practices.

    Response: site specific reforestation recommendations, outlined in the Licensee Development Plan, must be approved by the Forest Service.

12. Concern: inadequate attention is given by the Forest Service and Water Management Branch to frequent and ongoing monitoring of all logging operations in the watershed areas.

    Response: during operational harvesting the Forest Service is committed to once weekly inspections; Slocan Forest Products is committed to daily supervision (Section 6.5).

13. Concern: wood fibre from the watershed areas is not fully utilized.

    Response: Forest Service utilization standards are specified in all Cutting Permit documents. Failure to meet these standards may result in assessment for waste.

14. Concern: Inadequate attention is given to slash disposal.

    Response: Upon completion of harvesting all cut blocks are assessed for slash disposal; the Licensee is instructed accordingly.

3.3 RECREATION

1. Concern: "normal rules of road use" be adopted for all roads in the watershed area to permit implementation of the Government policy of "multiple use".

   Response: roads within the watershed area are public roads and therefore are open to general public use.

2. Concern: the potentials for recreation are inadequately identified, developed and managed in the watershed area.

   Response: recreation potential within the watershed is considered to be low. No site development is existing or planned.

3.4 MINING

1. Concern: mining exploration and development may negatively impact water quality, quantity, and timing of flow.

   Response: the adopted policy for "community watershed planning" is applicable to all provincial government agencies. The Ministry of Energy, Mines and Petroleum Resources includes requirements for environmental protection in all licences and permits.

2. Concern: mining exploration and development may negatively impact the visual quality of the area.

   Response: Visual Quality Objectives for the Slocan Valley have been established in the Slocan Valley Development Guidelines. Visual Landscape management measures will be implemented to minimize the impact on visual quality.

3.5 PUBLIC HIGHWAYS

Concern: the impact of Ministry of Highways road on water quality.

Response: the Ministry of Transportation and Highways continues to maintain gazetted public highways. Ministry maintenance activities must comply with the guidelines outlined in Section 6.0.

4.0 RESOURCES OF THE SPRINGER CREEK WATERSHED

4.1 WATER

Within the Springer Creek planning unit there are three main watersheds supplying domestic and irrigation water to fourteen licenced water users. The three main watersheds are: Springer Creek, Climax Creek and Vincent Creek. The principal water users are the Village of Slocan and the Brandon Improvement District. Table III lists all licenced water users within the plan area.

4.11 Springer Creek

The main stem of Springer Creek has a total demand of 121,590 g.p.d. based on a 120 day irrigation period and the total watershed demand is equivalent to 222,590 g.p.d.

In 1985, the Village of Slocan supplied 400 people, 187 residential properties and 16 commercial properties. The main source of water for the Village of Slocan is Gwillim Creek. Springer Creek is only utilized as a secondary source of water when maintenance and cleaning is required on the Gwillim Creek water system. Maintenance work is normally planned during the fall and it takes 4 to 7 days to flush the pipelines of sediments. Springer Creek is therefore only necessary for one week of the year during the fall. The Village estimated that in 1985, they utilized 2,000,000 gallons and only 80,000 gallons in 1984 from Springer Creek.

Coliform sampling on Gwillim Creek has indicated positive results and the Ministry of Health has requested boiling of water or disinfection be included. A study is currently under way by Stanley & Associates to assess improvements to the Gwillim system and effectiveness of the Springer system.

Brandon Waterworks District holds C.L. 51524 on Springer Creek but has yet to exercise its right to divert water from Springer Creek to their District. They have not constructed any intake or works on Springer Creek to this date.

Information in water licence reports indicate that these two communities do not utilize Springer Creek as their primary sources, as Springer Creek is subject to bed loading during peak flow periods in the spring causing turbid water. Brandon Waterworks District has experienced water shortage problems with their system from Climax Creek and are planning to install a system on Springer Creek.

The Village of Slocan's water system on Springer Creek consists of a 35 foot long by 8 foot high log dam with 4 inch transmission pipe connected to their distribution system. No treatment (settling or disinfection) occurs on the Springer Creek water. Active storage depth behind the dam is approximately 2 feet due to sediment build up.

Individual water licences have constructed rudimentary intakes with pipelines conveying the water to area of use. North Properties Ltd. hold C.L. 51697 on Dayton Creek but are not utilizing the water as milling of the ore is not occurring on their property at this time. A series of small springs have been developed as a water source but are not licenced under the Water Act. These springs are located downslope of km one on the Dayton Creek access road.

No flow measurements have been taken on Springer Creek during the low flow period to indicate the 1:5 year base flow. Review of hydrometric stations from representative watershed would indicate that a 1:5 year base flow figure to be 5.3 cubic feet per second (0.15 m^3/sec). Water is in good supply in the Springer Creek watershed to accommodate existing and future licencing.

Review of records revealed that no water quality sampling has been conducted within the Springer Creek watershed. Observations by Water Management Branch personnel indicate that Springer Creek can flow very turbid during peak flow events or during extended wet periods. Muddy water is attributed to natural bed loading and slumps, past road construction and maintenance procedures, mining activity and logging activity.

Preliminary assessment of principal existing erosion areas by Ministry technical staff (pedologists and hydrologists) would suggest that effective rehabilitation measures would require major expenditure of time and monies. The most viable solution to achieving good clean potable water from Springer Creek is to construct a proper intake with settling, screening and water treatment capabilities.

Dayton Creek is licenced to Northo Properties Ltd. for 100,000 g.p.d. for mining purposes. Investigation has revealed that the water is not being utilized and alternate proposals are being considered. A series of small springs developed by ditches and pipelines may actually be supplying the mining companies needs. This water use should be licenced under the Water Act. During development of the Dayton Creek access road the sub-surface flow of these springs was intercepted. Construction of the road to this "wet area" was considered with the result of the springs flowing clean during the 1986 freshet.

Histroically, gravity fed water has always provided the most efficient supply of water for the residential and commercial properties in the area. Developments within this management area must be cognizant of the importance of the potable water resource that flows from these watersheds.

Flooding Concern

The Village of Slocan is situated on the alluvial fan of Springer Creek. Bed load material from Springer Creek has accumualted on the valley bottom of the Slocan River thus damming the river and influencing the formation of Slocan Lake. The Slocan River does not have sufficent velocity to move the relatively large material deposited by the steeper gradient Springer Creek.

The stream gradient of Springer Creek changes dramatically at the apex of the alluvial fan at elevation of 570 meters. The stream gradient on the alluvial fan is 8%, from elevation 570 m to 635 m steep bedrock canyon is 25%, from 635 m to 690 m is 20%, from 690 m to 740 m is 5%, from 740 m to 815 m is 10%, from 815 m to 895 m is 12%, 895 m to 930 m is 10%.

The reduction in gradient from the 25% canyon reach to the 8% alluvial fan reach results in bed load and suspended material being deposited within the alluvial

fan increasing the potential for channel blockages and migration. Developments within the watershed must be very cognizant not to increase bed loading or movement.

Springer Creek has an overall channel stability rating of moderate with high ratings from 570 m to 690m and 740 m to 815 m. Seven active zones of mass wasting have been identified along with five debris jam zones, two major ones occurring just below the confluence of Dayton Creek. The mass wasting and debris could be associated with an old haul road (Ottawa Hill Road) that parallels the creek on the left upper bank for most of the main stems length.

Flooding on the Springer Creek fan can occur for two reasons: 1) excess water flow in relation to channel capacity, 2) channel capacity reduced below water flow requirement.

The most critical area for flooding is directly within the Village of Slocan. With two large culverts constructed in Springer Creek and Springer Creek being totally contained within pipeline system under the mill site of Slocan Forest Products, the potential for channel blockages is incurred.

4.12 Climax Creek

Climax Creek is licenced for a total demand of 14,000 g.p.d.. In 1985, the District advised that they supplied 16 residential connections (37 people) with water and that they utilized approximately 3 million gallons during the year. Brandon Improvement District received C.L. 51527 in April 1974 and utilized Climax Creek as their primary source. The water users in what is now the Brandon Improvement District have been using this creek without licence since 1925 and have advised that during some years the creek has been very low and could not supply the demand of the community.

Two spot flow measurements have been taken during wet periods and do not represent the amount of water generally available during low flow winter months or high demand periods during the late summer months: March 12, 1984 - 80,000 g.p.d., September 22, 1978 - 65,000 g.p.d.

Climax Creek is considered fully recorded with the present licences. Unauthorized uses in the past have also resulted in water shortages.

Brandon Improvement District has constructed a 3 meter wide concrete catch basin downstream of the highway. A 4 inch transmission line runs from the intake to a 4000 gallon storage tank then to the District and provides approximately 68 pounds of pressure to the lowest connections. An old intake was utilized above the highway as a precaution to prevent disturbance from the highway. Water quality problems have not been associated with the highway and only occur during periods of high flows. With continued maintenance the present diversion system and works should minimize sedimentation problems during spring freshet. No treatment facilities have been constructed by the District. The District does not utilize their licence on Springer Creek.

Coliform sampling on Climax Creek by the Ministry of Health has indicated positive fecal and total coliform counts. No water quality sampling of sediments has taken place.

Flooding Concern

Climax Creek drains a narrow south aspect watershed that has a drainage area of approximately 2 km^2 (.8 mi^2). Minor flooding does occur on some lower properties in Brandon Improvement District and the Village of Slocan.

4.13 Vincent Creek

Vincent Creek has a licenced demand equivalent to 51,130 g.p.d. based on a 120 day irrigation period. This small 94 ha watershed supplies 5 individual water licensees with domestic and irrigation water. Systems are generally very rudementary consisting of small impoundment dams and pipelines. Miscellaneous flow records indicate that the volume of water available for licencing is 200,000 g.p.d.

No water quality sampling has taken place on this source. With no developments within the watershed, it is assumed that water quality remains high during the majority of the year except for during spring freshet when increased flows result in higher suspended sediments. Licences have been granted on Vincent Creek since 1922.

Flooding Concern

There is no flooding concern within this watershed.

4.2 VEGETATION AND TIMBER

4.21 Vegetation[6]

There are two principal biogeoclimatic zones identified within the Springer Creek drainage: the Interior Cedar Hemlock (ICH) zone and the Engelmann Spruce - Subalpine Fir (ESSF) zone. Species composition, site location, and soil characteristics provide the basis for further delineation into more homogeneous units and ultimately into site specific ecosystems. Field identification of these ecosystem units form the basis for forest management prescriptions. (Refer to Map 3.)

1. ICH: the most productive biogeoclimatic zone in the B. C. Interior with the highest diversity of tree species in the province. Though the principal subzones (ICHa1 and ICHa2) share many tree species (Douglas fir, lodgepole pine, Engelman spruce, western red cedar, western hemlock, western white pine, western larch) they are distinguished by differences in understory vegetation and in the dominant trees of seral stages. The ICH occupies approximately 40% of the watershed area (10% ICHa1 and 30% ICHa2).

2. ESSF: this biogeoclimatic zone characterizes the upper slopes immediately below the treeless alpine tundra. Engelmann spruce and subalpine fir are the dominant tree species with logepole pine a major component on those sites disturbed due to fire. The principal subzone is the ESSFc which occupies approximately 50% of the watershed area. The ESSFcp characterized by scattered trees and shrubs constitutes the transition zone between well established forest and the severe condition of the alpine tundra (AT). Together the ESSFcp and the AT occupy approximately 10% of the watershed area.

4.22 Timber[3]

The major commerical species of the Springer Creek Planning Unit are Douglas fir, lodgepole pine, subalpine fir and Engelmann spruce. Lesser volumes of western hemlock, western larch, and western white pine also occur as do minor volumes of red cedar, white bark pine and ponderosa pine. Derived from the inventory used in the 1981 TSA Analysis Report, the volume breakdown by species is as follows:

Douglas fir	176 707 m^3
Lodgepole pine	88 354
Subalpine fir	88 354
Engelmann spruce	82 463
Western hemlock	54 779
Western larch	40 643
Western white pine	35 930
Western red cedar	17 082
White bark pine	2 415
Ponderosa pine	412
	587 139 m^3

WHY?

NOT CLEAR AS TO WHETHER HARVESTING IS RULED OUT ALTOGETHER ABOVE THE EPF LINE, OR ONLY FOR THE INITIAL 20 YEARS.

This volume represents the total supply of merchantable timber for the 20 year period 1980-1999 and includes 10% of the mature timber above the Environmental Protection Forest (EPF) line. The estimated volume of harvest for this same period, 193 756 m^3, would be removed from the operable forest land base (4070 ha or 77% of the watershed area). Harvesting is not planned for the portion of the watershed above the EPF line (1220 ha or 23% of the watershed area). The following summarizes the projected harvesting activities for the 20 year period 1980-1999.

Watershed area	5 290 ha
Operable forest land base	4 070 ha
Non-operable area (above EPF line)	1 220 ha
Area harvested to date	493 ha
Area proposed for harvest (SFP Five year development proposal)	395 ha
Total area projected for disturbance	888 ha
% of Watershed projected for disturbance	16.8%
Total timber supply	587 193 m^3
Projected volume of harvest	193 756 m^3
Volume harvested to date	120 578 m^3

Further information is provided in Tables II and IV (Appendix IV) and in the enclosed Maps (Appendix V).

4.3 RECREATION

Recreation use within this area is considered low at the present time with some hunting taking place during the fall. No site development is existing or planned. Recreational activities, at present, are limited to hunting, fishing, snowmobiling and cross-country skiing.

4.4 LANDSCAPE

The Forest Landscape Handbook is presently used as a guide by Managers to manage the landscapes of the province.

The boundary of visible areas have been plotted on the base map as seen from different locations such as travel routes, population centers and areas of extensive public use. Prominent features as viewed from these locations are indicated by arrows. These landscape areas have been defined further under the headings of High, Medium or Low sensitivity levels based on how and from where they are seen.

Visual Quality Objectives (VQO's) are applied to visual areas and are described as Preservation - no activity, Retention - activity should blend with features, Modification - activity dominates original features and Maximum Modification - permits a dominate change to the original landscape.

High landscape sensitivity is associated with preservation, retention and partial retention. Medium landscape sensitivity would fall into the retention, partial retention and modification categories. Low landscape sensitivity is within the area that most activity takes place, partial retention, modification and maximum modification.

4.5 SOILS

Information on the soil resources in the Springer Creek watershed is available in an overview format in the Slocan Valley Plan technical report and in the "Soil Resources of the Nelson Map Area RAB Bulletin 20". Additional soils information is collected during silvicultural examination as outlined in Section 6.25. This information will assist in field proofing the ESA (Es) information available on the MOF Inventory maps at a 1:20 000 scale. Where deemed necessary due to site specific conditions, a more detailed terrain analysis, as conducted for sub-unit I-Dayton Creek, will be undertaken. The maps comprising the detailed terrain analysis for sub-unit I are available for viewing at the Arrow Forest District office.

4.6 FISHERIES

Fishery values within Springer, Climax and Vincent Creeks are low. Little spawning habitat is available to lake inhabiting species. There are resident trout populations in the streams.

4.7 WILDLIFE

Deer summer range is located throughout the Springer Creek drainage from mid to high elevations. Areas less than 1200 meters in elevation on the south-southwest aspect of

Springer Creek and west aspect of the Slocan Valley exhibit wintering capability. A relatively large portion of the mid to high elevation sites within the Plan area has potential to support woodland caribou. Both black bear and grizzly bear are found in this drainage. In addition, there is a variety of other life forms such as avian wildlife, furbearers, and small mammals distributed throughout the Plan area. Hunting of wildlife occurs in the Springer Creek drainage and opportunities for viewing and photography exist. There is one licenced trapline in the area and at present no guiding territory exists.

4.8 MINING AND AGGREGATES[9]

Traditional minerals produced within the Slocan Valley have been silver, lead and zinc though possibilities do exist for the occurrence of other types of economically significant mineral deposits. Mining activity fluctuates greatly in response to metal prices and technological changes.

The drainage may contain important deposits of sand and gravel. Following extraction or depletion of identified deposits, suitable reclamation activities will be implemented.

5.0 RESOURCE MANAGEMENT OBJECTIVES FOR THE SPRINGER CREEK WATERSHED

Part I of the Slocan Valley Development Guidelines identify resource and environment management policies for each resource activity in the valley at a general landscape level. Those policies, objectives and implemented methods are the guiding principles for resource activity within the Springer Creek watershed.

5.1 WATER MANAGEMENT OBJECTIVES

These objectives reflect the importance of Springer Creek as a Category 2 watershed.[1] The Village of Slocan and Brandon Waterworks District utilize it as their secondary community water supplies.

- to maintain the hydrologic balance between soil, water, and vegetation to obtain optimum functioning of the watershed.

- to manage the water resource to meet existing licenced demand on the area streams and any further water demand for domestic, irrigation or industrial purposes by allocation of the water resource through a licencing system and monitoring of its use.

- to maintain the base flow in Springer Creek.

- to minimize the potential for damage and loss of life caused by flooding and erosion from peak flows.

- to maintain or enhance water quality at a level that meets ambient water quality standards.

- to foster public awareness of the water resource and relevant legislation.

5.2 FOREST MANAGEMENT OBJECTIVES

These forest management objectives are described in terms of forest harvesting, forest protection and reforestation.

- to provide harvestable and merchantable timber which will contribute to the maintenance of an economically viable timber processing facility.

- to plan harvesting operations that will minimize site disturbance and the impact on other resources.

- to protect and manage the timber resource so as to minimize the loss and damage caused by insects and diseases.

- to protect forest resources from loss and damage due to fire by maintaining a capability to meet the "10 a.m. concept".

- to re-establish forest land disturbed by fire or by harvesting by prompt planting of those sites not expected to regenerate by natural means or within an acceptable time period.

- to maintain the productivity of immature stands by impairing the establishment of non-commercial species and by enhancing the growth of preferred commercial species.

- to adopt as standards for the Dayton Creek permit (CP 46) the maximum acceptable levels of site disturbance, based upon defined site sensitivities, as described in the F.S. draft procedures "Reduction of Productivity Losses from Logging Operations". (Site sensitivity categories have been identified and mapped on the Dayton Creek slope through the detailed terrain analysis conducted by the F.S.) This information is available for viewing at the Arrow Forest District Office.

5.3 LANDSCAPE MANAGEMENT OBJECTIVES

- to minimize the visual impact in the primary visual area.

5.4 RECREATION OBJECTIVES

- to provide opportunities for wildland recreation which are compatible with other resource management strategies.

5.5 FISH AND WILDLIFE OBJECTIVES

- to preserve and enhance significant habitat areas to ensure the continuation of a wide variety of wildlife species.

- to maintain, protect and enhance (where possible) habitat areas to ensure fish production at current levels.

- to provide opportunities to utilize the fish and wildlife resources of the area.

5.6 MINING OBJECTIVES

- to provide for and encourage mineral exploration development and production.

- to identify and protect sand and gravel resources to meet future requirements and to suitably reclaim extraction sites.

6.0 IMPLEMENTATION TECHNIQUES

This section outlines measures to be implemented for the various phases of licenced resource development and use in the plan area. They are specific requirements developed to encourage responsible resource development and to ensure maintenance of all resource values within the plan area.

It is intended that these guidelines be amended, from time to time, to allow for changes in technology, or for better solutions as they become known and to take account of site conditions where special consideration is required. Any and all deviations from these guidelines shall be referred to the Technical Review Committee prior to their approval.

These measures are to be interpreted as consistent with existing policies and responsibilities of provincial agencies and shall be applicable to all development activities approved within the plan area.

6.1 ACCESS

6.11 Planning

1) Future road access within the Springer Creek watershed must be planned according to the overall watershed management requirements of:

- maintaining a stable watershed hydrologic system for optimum production and regulation of water yield, and

- facilitating the implementation of a well-designed forestry program for the protection of the forest against insects, diseases and fires, along with other logging and silviculture activities.

2) Short-term and long-term road requirements must be considered during the planning phase to avoid situations where the road system is inadequate for future needs.

3) Future road construction should ensure that all main and secondary roads be carefully located and designed, constructed and maintained to keep any detrimental impact on stream flow characteristics and slope stability to the lowest practicable level.

4) The planning phase involves the evaluation of environmental and economic trade-offs. A serious erosion potential indicated by an objective analysis may dictate the method of logging for the area or may, in fact, eliminate logging because reduction of erosion impacts is not feasible at the time.

5) Road use and construction shall be administered through Road Use and Construction Permits issued by the Forest Service or through permits issued by the Ministry of Energy, Mines and Petroleum Resources.

6.12 Location

1) Use all available topographic surveys, soil and landform maps, and other soils and geologic information to select road locations that avoid steep slopes and unstable soils as well as meeting the total watershed management requirement. Forest managers shall make the best use of services provided by specialists in soils, geology and hydrology to develop local slope stability standards.

2) Roads must be located to avoid unstable soils. Where practical alternatives do not exist the collective experience of specialists (hydrologists, pedologists, engineers, etc.) shall be used to assess critical sites and to recommend suitable design options.

3) Road density shall be kept to a minimum through careful layout that considers watershed impact, terrain, harvesting needs, skidding methods, future resource development and latest logging techniques.

4) Streams should be crossed at locations where channel and bank disturbance will be minimal. Stream crossings should be kept to a minimum.

5) All major stream crossings will require authorization under the Water Act by the Water Management Branch. Major stream crossings are defined as crossings on main streams in close proximity to water intakes or private land or sensitive crossings.

6) Where possible, no roads should be located adjacent to natural stream channels.

7) Road location work is to take place during peak run-off period so as to allow the accurate identification of intermittent streams.

8) Newly constructed access roads shall be left to stabilize before operational use. The objective is to construct such roads 2 years before they are required for hauling, though, some circumstances may require more immediate use.

Implemenation Guidelines

A road access plan will be prepared for the Springer Creek planning unit in conjuction with other areas in the Slocan Valley.

6.13 Design

1) Future maintenance needs are an important consideration to assure stability and economic use of the completed road. If frequent maintenance cannot be assured, this must be accounted for in the design so that erosion is minimized.

2) Road gradients are to be kept below 10% except where short sections are needed to take advantage of favourable topography.

3) Excessive sidehill cuts and fill must be avoided especially near stream channels.

4) Where stable fill construction is impossible or too costly, roads are to be designed for full-bench (end haul) construction.

5) Backsloping shall be reduced by rounding the tops of cut slopes.

6) Road surfaces must not drain to hazard areas.

7) Road surfacing will be required in non-cohesive soils and/or when grades exceed 8%.

Implementation Guidelines

All road plans are to respect the above constraints.

All road plans are to be referred to the Springer Creek IWMP Technical Review Committee prior to construction.

6.14 Stream Crossings

A drainage system is used to intercept and remove surface and subsurface runoff for safe dispersal of water into stabilized stream channels. The importance of adequate drainage in a road system cannot be overemphasized as most failures result from improper drainage.

1) Culverts or bridges are required for all natural water courses. Prior to the installation of these structures, approval must be obtained from the Water Management Branch.

2) No creeks are to be forded except during the installation of drainage structure and only with prior approval from the Ministry of Forests and the Water Management Branch.

3) Embankments and channel sides at drainage structures are to be protected and where necessary rip-rap is to be used.

4) Limit grade of roadside ditch to 10% in severe hazard areas by constructing energy dissipators. (Refer to Erosion Hazard Chart.)

5) Material removed from ditches and culverts during maintenance shall be deposited in suitably stable areas.

6) Stream crossings shall be located a minimum distance of 300 meters above licenced intakes or as specified by the Regional Manager of the Water Management Branch where unusual silting problems exist.

7) The toe of road embankments shall be located the following distance away from the high water mark of streams, unless otherwise authorized.

Slope, Road to Stream %	Horizontal Distance (meters)
0 - 10	15
10 - 20	30
20 - 30	40
30 - 40	50
40 - 50	65
50+	75

Implementation Guidelines

All major stream crossing proposals are to be reviewed by Water Management Branch.

All road plans are to respect the above guidelines.

6.15 Road Drainage

1) All road surfaces are to be designed to facilitate surface drainage, i.e. insloping or crowning.

2) Ditch gradient is to be great enough to prevent silt deposition.

3) The maximum spacing for cross-drains should not exceed the distances set out in the following table. (Refer to Table V). Cross-drain location will be influenced by the natural drainage pattern.

Road Grade	Severe Hazard	Moderate or Slight Hazard
0 - 3%	250 meter	250 meter
3 - 5%	150 meter	250 meter
5 - 8%	100 meter	150 meter
8% +	60 meter	100 meter

4) Drainage structures shall be designed to accommodate at least the 25-year return period flow and preferably the 50-year frequency flow for bridges and major culverts. A minimum culvert size for the area will be 500 mm for

identified water courses and 400 mm for cross-drains dissipating ditch run-off.

Drainage structures that are designed for the 1:25 year peak event and are properly maintained, will provide the necessary protection for water quality. The guideline does state that design to the 1:50 year event is preferred. Designing to the 1:100 year peak event would not guarantee no flood problems. Water Management Branch, through the referral process, will review all stream crossings and require authorization under Section 7 of the Water Act for major stream crossings or crossings that have greater concerns for flooding or erosion problems.

Calculated design flow for drainage structures can be checked by the following information:

- Known flood history of the area or nearby region with similar hydrologic environment.
- Performance of drainage structures of similar streams.
- All available flow records of this or other comparable streams indicate that the 1:25 design flood flow for this area is 40 c.f.s. per square mile.
- Any field data indicating high-water marks, natural overflow channels, and old stream beds.

Implementation Guidelines

All road plans are to respect the above constraints.

All road plans are to be referred to the Springer Creek IWMP Technical Review Committee.

6.16 Road Closures and Deactivation

1) Roads are to be closed and stabilized as indicated in the access plan.

2) Many roads associated with timber harvesting are designed for use only for a short time. These roads should be closed along with any other roads that are needed only for intermittent travel to minimize maintenance expense and erosion hazards. In general, the road shall be left in such a state as to provide for adequate drainage and soil stability without continuous active maintenance.

Steps required for temporary road closure are:

- Block the road to vehicles.

- Remove all temporary culverts, including wood types, and temporary bridges. Remove all other culverts and bridges that cannot be maintained.

- Road surface should be water barred.

- Remove all berms, except those intentionally constructed for the protection of unstable fills. Care shall be taken not to spill graded material over the fill slope. The best way to accomplish this is to grade material toward the cut bank. Outslope only enough to divert water over the bank (approximately 2% to 3%, plus the slope gradient of the road in percent).

- When removing culverts and bridges, be sure all fill material is removed from below the high water line of the stream. All material that is removed should be placed in a safe disposal area. The remaining fill material should be left at a stable angle or adequately protected.

- Revegetate the road surface and areas disturbed by road closure operations along with any other areas of exposed soil.

Implementation Guidelines

The Ministry of Forests is to co-ordinate completion of the Access Plan. Road closure provisions are to be included in timber harvesting contracts.

6.17 Construction

1) Soil erosion is to be kept to a minimum by constructing roads under dry conditions, normally in the late summer and fall.

2) A thorough job of clearing and grubbing is required to ensure proper construction of fills. Overcasting onto brush and timber or incorporating significant brush and timber into the fill material can lead to serious surface and mass erosion problems.

3) Each section of road shall be completed before the end of the operating season with the surface bladed, drainage structures installed and ditches finished.

4) Any debris accidentally deposited into creeks is to be removed immediately. In situations where more damage may be done by removal of this debris, the Forest Officer and Water Management Branch should be contacted.

5) There is to be no operation of road construction equipment in stream channels except with prior approval from the Water Management Branch.

6) Wherever possible, stream flow is to be diverted from the construction site in order to reduce turbidity.

7) Slope stabilization work is to be kept current.

Implementation Guidelines

The above constraints are to be integrated into road construction contracts and plans.

Monitoring of active operations shall be as per Section 6.5.

Concerned citizens can assure compliance with the above conditions by "watchdogging".

Road plans are to be reviewed by the Ministry of Forests and Water Management Branch.

6.18 Road Maintenance

Good road maintenance is an absolute necessity to assure effective erosion control throughout the life of a road. Following construction, inevitable deficiencies in design and construction practices may require modification or repair, and traffic use and natural deterioration also call for frequent and diligent maintenance.

1) Fully and thoroughly maintain all portions of the road system to minimize erosion prior to and during heavy (spring) runoff and/or heavy rainstorm periods to ensure a stable road system.

2) Culverts, cross drains and dips on all roads shall be inspected and cleaned prior to heavy runoff and/or the rainstorm season and periodically during that season to prevent clogging and the possibility of washouts. For at least 30 meters above culverts, the stream channels shall be cleared of recent logging and right-of-way debris that

might clog the culverts. Cross drains and dips are oft damaged during high use periods or sometimes even remov for more efficient traffic flow; they should be replace before the rainy season or snowfall.

3) Ditches shall be cleared of debris and sediment accumulations, with care being taken to avoid disturbing stabilized ditch bottoms. Avoid undercutting the road c when removing slide debris.

4) All ice and snow berms created during winter hauling sha be broken before the spring runoff begins.

5) Erosion control structures shall be carefully protect from damage caused by vehicle and equipment operations.

6) Grade the road surface as often as necessary to retain t original surface drainage (either insloped or outsloped). Take care to avoid side-casting graded material over the fill slope. Carefully monitor surface drainage during se periods and close the road if necessary to avoid undue damage. Restore surfacing when required.

7) Inspection shall be made of all roads after intense or prolonged rainstorms or heavy spring runoff period to determine the need for correction or improvement of erosion control and watershed stabilization measures.

6.19 Slope Stabilization

Slope stability can be enhanced by revegetation and other measures to control surface erosion on road cut and fill slopes and on waste and borrow areas. Usually the objective is to establish a dense vegetative cover to reduce forces available for erosion and increase surface protection. It must be realized that vegetative treatments are not a cure-all and cannot be recommended for universal application. Revegetation of road cut and fill slopes is also undertaken to achieve the improvement of aesthetics, wildlife habitat and soil properties. The Ministry of Forests shall assess such sites to determine the need and/or practicability for revegetation treatment.

6.2 HARVESTING

6.21 Cut Block Lay-Out

1) Harvesting, including clearing of private lands shall limited to less than 30% of any watershed area including its tributaries.

2) The Water Management Branch is to review the location of all cut blocks prior to their approval

3) Wherever economically and silviculturally feasible, shelterwood or selection systems are to be employed that remove less than 50% of the canopy cover.

4) Second pass logging is not to take place until first pass blocks have greened-up. "Green-up is defined as that point when a block is sufficiently restocked with an acceptable specie(s), free-to-grow and of sufficient crown closure and height to mitigate hydrological impacts from planned disturbance on adjacent areas." (Various researchers suggest 50-60% crown closure and 5-10 m height to be acceptable ranges for effective "hydrologic green-up".)

5) Clear cut opening size shall not exceed 40 ha. Cut block layout should be governed by the following:

Mass Wasting/ Erosion Hazard	Maximum Downslope width (m)		Minimum Downslope Reserve Between Cut Blocks (m)	Maximum. Block Size (ha)
	N.Aspect	S.Aspect		
Slight	800	600	300	40
Moderate	600	400	400	30
Severe	400	200	600	20

If the downslope width of cut blocks is less than the prescribed maximum, the reserve blocks may be reduced accordingly. Cut blocks should be staggered to avoid vertical stacking.

6) Landings shall be located at least 30 meters from stream channels unless topographic factors dictate otherwise.

7) In general, edges of natural openings, riparian areas and roadsides will be retained as buffer strips to provide wildlife cover, visual screening and to afford some stream protection.

Implementation Guidelines

All logging plans and contracts are to respect the above constraints.

Prior to any logging taking place, a harvesting plan is to be presented to the Springer Creek IWMP Technical Review Committee.

6.22 Buffer Strips

1) Properly designed vegetation strips of appropriate width shall be maintained along stream channels to give protection against accumulation of sediments and debris resulting from logging on channel sideslopes.

2) Buffer strips are to be wind-firmed by felling and removing old decadent stems prone to windfall and the selective logging "feathering" of the edges of buffer strips.

Implementation Guidelines

All logging plans are to respect the above constraints.

6.23 Skidding

1) Where required due to severe erosion hazard, skidding will be restricted to adequate snowpack conditions or cable systems. Generally, ground skidding will be limited to areas of less than 30% side slope. Depending on site specific conditions (including soil moisture, soil cohesiveness, soil stability and trafficability) ground skidding may be extended to slopes up to 50%. To minimize site disturbance, small cats are preferred on slopes between 30% and 50%.

2) Sidecutting for skid trails is to be minimized and must not exceed .6 meters.

3) Logging machinery is not allowed in any watercourse without prior approval of the Water Management Branch.

4) The contractor shall suspend skidding operations when moisture conditions dictate to minimize soil compaction or erosion.

5) Abandoned skid trails and roads shall be cross ditched (water bars) at all natural drainage ways and gullies. More frequent cross-ditching may be necessary and will be determined during the post-logging review.

6) No skidding machinery is to be operated within twenty meters of designated streams.

7) Pre-located trails (designated trails) must be established prior to commencement of harvesting operations.

8) Ground skidding must be avoided on unstable, wet or easily compacted soils by utilizing light floatation equipment, logging on a favourable snowpack and/or using overhead systems.

Implementation Guidelines

All logging plans and contracts are to respect the above constraints.

Monitoring of active operations shall be as per Section 6.5.

6.24 Post Harvesting Treatment

1) No piling of debris will take place in gullies.

2) The Licensee will suspend bunching and burning in severe wet weather.

3) All landing debris and all debris bunched for burning are to be piled at least 10 meters from standing timber.

4) Waterbars are to be constructed where necessary as determined during the post logging review.

5) Burning is to take place only as authorized by the Ministry of Forests.

6) Problem erosion sites identified during the post logging review shall be seeded immediately with erosion control seed mix.

7) Broadcast burning will not be conducted within 20 meters of perennial stream channels.

8) Post harvesting activities will be governed by the guidelines suggested in "A Field Guide for Identification and Interpretation of Ecosystems".

Implementation Guidelines

Burning must be conducted in accordance with the approved burning plan.

6.3 STAND MANAGEMENT

6.31 Reforestation

All sites disturbed due to fire or harvesting shall be assessed for immediate site treatment and prompt reforestation with suitable species as determined by using the Nelson Region Ecological Classification Guidelines.

6.32 Fertilization

The Forest Service does not intend to use fertilizers in the Springer Creek IWMP area.

6.33 Pesticide Use

At the present time there is no need to utilize pesticides in the Springer Creek IWMP area. Should the need arise, in the future, and where there is no other reasonable alternative available to deal with a serious vegetation or pest control problem, the Ministry of Environment and Parks shall consider proposals to use pesticides. Applications to use a pesticide must be submitted to the Pesticide Control Branch of the Ministry of Environment and Parks for evaluation and adjudication. The Technical Review Committee shall review all proposals should they arise.

6.4 PETROLEUM PRODUCTS

In general, petroleum products should not be stored within the watershed. Where such products are kept within the watershed, all fuel storage areas must be surrounded by impervious dykes and all fueling hoses must have automatic shut-off valves. All waste petroleum products resulting from equipment maintenance, etc. must be removed from the watershed for disposal.

6.5 MONITORING AND SUPERVISION

1) Strict and more frequent monitoring of development operations in the watersheds will be practiced.

2) A field inspection shall occur prior to spring break-up to determine remedial measures necessary to protect water quality.

Implementation Guidelines

During active harvesting or road construction operations Slocan Forest Products Ltd. shall provide daily supervision.

Other contractors or resource developers shall provide adequate supervision to ensure compliance with their licence or permit.

During active harvesting or road construction operations the Forest Service shall provide weekly inspections.
The Ministry of Energy, Mines and Petroleum Resources shall monitor specific development operations as requested.

The Ministry of Environment and Parks shall monitor specific development operations as requested.

6.6 MINERAL EXPLORATION/AGGREGATE DEVELOPMENT

1. Any exploration or mineral development shall be rigidly controlled by the Mines Act, the Mineral Act, the Mines Regulation Act and the Waste Management Act.

2. The Inspector of Mines and Gold Commission will display a map showing the boundaries of the Springer Creek Intregrated Watershed Management Plan area and shall endeavour to make miners and prospectors aware of its significance.

3. The Inspector of Mines shall require the owner, agent or manager of an exploration company to deposit a security of $2,500 per hectare of proposed disturbance prior to the commencement of any surface work and within 30 days of the issuance of a permit. This security shall be held by the Chief Inspector of Mines until the satisfactory completion of site reclamation. Pursuant to the Mines Act, Section 6, not less than 7 days prior to the cessation of work, a report of work done and reclamation completed shall be filed with the Inspector of Mines and Resident Engineer.

Implementation Guidelines

All operators must complete a "Notice of Work and Reclamation Program on a Mineral Property" and submit it for approval to the Inspector of Mines and Resident Engineer.

The Inspector of Mines or Resident Engineer shall refer all Notice of Work applications involving mechanical disturbance proposals to the Water Management Branch and to the Forest Service prior to approval.

The Ministry of Energy, Mines and Petroleum Resources shall include the appropriate conditions for environmental protection

in all licence or permit (conditions as per "Guidelines for Mineral Exploration", "Mines Reclamation Guidelines", or Section 6.0 "Implementation Techniques").

The Inspector of Mines shall monitor development activities to ensure compliance with conditions contained within the licence or permit.

The Inspector of Mines shall refer all inspection reports of work and completed reclamation to the Springer Creek Technical Review Committee.

Any access through Crown land to a mineral property will require a Special Use Permit issued by the Forest Service. Any Special Use Permit issued for this purpose shall include the appropriate environmental protection conditions as per Section 6.0, Implementation Techniques.

6.7 FISH AND WILDLIFE HABITAT

1) On non-winter areas, cut blocks approximately 20-30 hectares in size are desirable. Larger cut blocks may be suitable if selection or shelterwood methods are employed.

2) "Edge effect" should be maximized by designing irregular or elongated cut blocks.

3) Critical mid-winter ungulate habitat have been identified and must be intensively managed and should, therefore, have clear cut blocks which are approximately 5 hectares in size and which maximize edge.

4) A minimum of 20% of mid-winter habitat sites must exhibit canopy closure of 70%+.

5) It is important to maintain forested movement corridors between seasonal ranges.

6) Forest cover adjacent to high elevation slides and meadows is required to protect grizzly bear habitat requirements.

7) The preservation of some old growth forest stands is essential to maintain viable populations of species which are partially or wholly dependant upon these stands. It is recommended that 10% of forest producing sites be maintained at any one time as old growth, the distribution of which is extremely important.

8) Increased access can have significant effects on wildlife

populations and their utilization of specific areas. Access within all habitat types must be planned and managed. In addition to permanent all season roads, access planning must recognize the need for access closures in some areas. Proposed access routes are corridors only. Actual road layout should ensure that sub-alpine meadows, bogs or other important habitat components are not infringed upon.

9) The Technical Review Committee shall notify the registered trapper of impending operations.

10) Since the importance of the domestic water resource is emphasized, the objective of maintaining water quality and quantity is very high. We believe that measures taken to protect the water resource will afford adequate protection of the fisheries resource.

7.0 CONTINGENCY PLAN FOR RESOURCE DEVELOPMENT IN WATERSHEDS USED FOR DOMESTIC AND IRRIGATION WATER SUPPLIES WITHIN THE SPRINGER CREEK INTEGRATED MANAGEMENT AREA

7.1 INTRODUCTION

Condition 5 of the Policy and Procedures for Community Watershed Planning, November '84 requires that "licensed resource users will prepare a contingency plan for review by the planning group which provides for the maintenance of the water supply and the rehabilitation of the water system should damage occur which is deemed by the Ministries of Environment and Forests to be directly attributable to resource user activity".

The key phrases are - "maintenance of the water supply"
- "rehabilitation of the water system"
- "directly attributable to resource user activity"

The intent of a contingency plan is to make provision for the rehabilitation of the water system.

In resource management in watersheds used for domestic and irrigation water supply purposes, impairment to the water resource falls within two liability areas; natural impacts, and man-induced impacts. Before discussion of these two areas, it should be recognized that all parties have an obligation to identify and implement ways for integrating resource values in a consumptive use or community watershed and must be prepared to accept a reasonable degree of risk from resource activities. Also, it is a basic tenet of the law of negligence that every

person shall take "reasonable care" to avoid injury to another.

Under existing water management legislation in British Columbia any individual, community or landowner can obtain certain rights to the water resource.

Water rights must be obtained from the Crown by the issuance of a water licence or approval under the Water Act. It is the responsibility of the water user to have a valid water licence.

7.2 LIABILITY AREAS

7.21 Natural Occurrences

A water licence entitles its holder to divert and use beneficially for the purpose and during or within the time stipulated the quantity of water specified in the licence. The licence does not guarantee the quantity of water will always be available particularly during unusual drought conditions. If the impairment to the water resource is due to natural occurrences, the responsibility falls to the water licensee to rehabilitate his water system. If rehabilitation works are required on the water source, prior authorization under the Water Act must be obtained from the Water Management Branch.

7.22 Man-Induced Impairment

The Forest Service has statutory responsibilities under the Forest Act and Range Act to manage provincial forest land for a mix of resource uses to achieve a range of public benefits. The administration of this legislation results in conditions being written into timber licenses, road development contracts, grazing permits, etc. that impose specific responsibilities regarding protection of the water resource.

A "save harmless" clause will be included in all contracts, licences and permits indemnifying the Crown against damages resulting from operations being carried out in contravention of the conditions in such documents. The contractor, licensee or permittee will be responsible for damages and repairs due to consequences of his activity.

7.3 CONTINGENCY PLAN

The contingency plan will allow for an immediate response to deal with adverse effects on the water resource and water

licensees. It is believed the inspection of problems on the ground will clarify the required rehabilitation measures, and persons responsible for the restoration work. The problems will have to be rectified "by the parties who are responsible".

If problems result in a watershed, all parties involved must have effective communication to allow for immediate response to rectify the situation. Reasonably well developed and implemented activities will help ensure problems do not occur.

7.31 Major Participants

1) Ministry of Environment and Parks
2) Forest Service
3) Licenced Water Users
4) Timber Harvesting Contractors
5) Road Construction Contractors
6) Forest Licensee
7) Ministry of Health
8) Ministry of Energy Mines and Petroleum Resources
9) Miners and Prospectors

7.32 Area of Application

This contingency plan applies to:

Area "A": Springer Creek
Area "B": Climax Creek
Vincent Creek
Dayton Creek
Silver Bend Creek

7.33 Contact Persons

1) Ministry of Environment and Parks - Water Management Branch
- J. Dyck - (W) 354-6370 (H) 352-7049
- K. Gorsline - (W) 354-6370 (H) 352-5832

2) Forest Service, Arrow Forest District
- K. Arnett - (W) 365-2131 (H) 365-8345
- R. Augustin - (W) 365-2131 (H) 359-7439

3) Licenced Water Users
- Village of Slocan - 355-2277
- Brandon Waterworks District - 355-2464
- Individual water licensee -see Table IV

4) Timber Harvesting Contractors
- to be designated

5) Road Construction Contractors
   - to be designated

6) Forest Licensee - Slocan Forest Products Ltd.
   - T. Dods - (W) 355-2216
   - D. Wickstrom - (W) 355-2216

7) Ministry of Health

8) Ministry of Energy, Mines and Petroleum Resources
   - A. O'Bryan - (W) 354-6125

9) Miners and Prospectors
   - to be designated (refer to 9-10 -- obtain list from Mines)

7.34 Responsibilities of Participants

7.341 The Ministry of Environment and Parks, Water Management Branch, shall:

1) Administer the Water Act.
2) Issue water licences.
3) Evaluate waterworks as to: licencing, efficiency, life span, quality, quantity of water delivered.
4) Advise the planning process of water licences' location, volume and efficiency.
5) Conduct field inspections to evaluate proposed plans and identify potential problem areas.
6) Determine what remedial action is to be taken under the Water Act.
7) Advise on and encourage the operation and maintenance of water quality and quantity monitoring stations.
8) Provide technical information and support to help rectify water resource problems.
9) Deal with individual cases when they arise having regard to any special circumstances or hardships.
10) Respond immediately to field inspections if impairment to water quality and/or water quantity occurs.
11) Respond immediately to rectify situations which show potential for impairment of water quality and quantity.
12) Advise applicants for a water licence of other resource uses that are occurring or that may occur that could affect their water supply.

7.342 The Forest Service shall:

1) Administer the Forest and Range Acts.
2) Ensure watershed protection clauses are included in harvesting and development contracts.
3) Monitor harvesting and development to ensure compliance with contract conditions.
4) Respond immediately to requests for field inspections if impairment of water quality or quantity occurs.
5) Respond immediately to rectify situations, which show potential for impairment of water quality or quantity.
6) Provide information and support to help rectify water resource problems.
7) Deal with individual cases when they arise having regard to any special circumstances or hardships.

7.343 The Licenced Water User shall:

1) Have a valid water licence.

2) Subject to compliance with the Water Act, be responsible for the installation and maintenance of systems capable of handling naturally occurring sediment loads and flow extremes.
3) Make records of improvements and maintenance available to the planning process, for example, size of pipes, etc.
4) Provide normal maintenance of systems.
5) Document frequency of maintenance work on water systems.
6) Accept this contingency plan.
7) Accept financial responsibilities for damages caused by natural occurrences.
8) Participate in field inspection of road construction, logging operations, and other resource developments and advise the planning process of their concerns.
9) Cooperate in the rehabilitation of the water resource and water systems where there is an impairment of water quality and quantity due to resource development.

7.344 The Contractor (and this may include a Forest Licensee, Timber Sale Licensee, Road Construction Contractor, Harvesting Contractor, Miner, Prospector or other Resource Developer) shall:

1) Operate within contract responsibilities.
2) Supervise field operators to ensure accurate execution of plans and contracts.
3) Ensure that development plans incorporate the concerns of all other resource values.
4) Cooperate with regulatory officials, water users, and other planning process participants in information exchange.
5) Participate in plan reviews or field inspections, as required.
6) Advise Water Licensees, the Water Management Branch, and the Ministry of Forests of situations potentially harmful to water quantity or quality.
7) Inform sub-contractors and operators of their obligations.
8) Advise affected Water Licensees prior to planned interruptions or planned potential sediment increases as a result of, for example, culvert or bridge installations.
9) Suspend operations during adverse weather conditions.
10) Fulfill all specific responsibilities for the protection of water quantity and quality as outlined in Sections 7.42 and 7.43 of this report.
11) Deal with water impairment problems in cooperation with Water Licensees and regulatory agencies immediately.

7.345 The Ministry of Health shall:

1) Administer Health Act and other related legislation.
2) Provide technical information and support to help rectify water resource problems.
3) Deal with individual cases when they arise having regard to any special circumstances or hardships.

7.346 Ministry of Energy, Mines and Petroleum Resources

1) Administer the Mines Act, the Mineral Act and the Mines Regulation Act.
2) Participate in the integrated watershed planning process.
3) Provide information on existing mineral claims and their development
4) Ensure watershed protection clauses are included in exploration permits, mining licences or mineral leases.

5) Monitor activities, road construction and developments related to exploration and mining.
6) Respond immediately to requests for field inspections if impairment of water quality or quantity occurs.
7) Respond immediately to rectify situations which show potential for impairment of water quality or quantity.
8) provide information and support to help rectify water resource problems.
9) Deal with individual cases when they arise having regard to any special circumstances or hardships.

7.4 COURSES OF ACTION

7.41 Alternate Water Supply

For the purpose of this Contingency Plan an "alternate water supply" is defined as water of sufficient quantity, quality and pressure to maintain the normal domestic and irrigation practices of the licensed water users. If delivered from a source other than the watersheds contained within the planning area, the water must meet public health standards.

7.411 Alternative water supplies for Area "A" (Springer Creek)

The Village of Slocan utilizes Springer Creek only as a secondary water supply, therefore, they will switch to their primary system with limited cost. Historically the Springer Creek system is only utilized by the Village during October, during maintenance on the Gwillim Creek system.

7.412 Alternative water supplies for Area "B" (Climax Creek, Vincent Creek, Dayton Creek, Silver Bend Creek)

An alternate supply could be delivered by:

- the digging of wells and providing pressure pumping
- construction of pipelines from adjacent drainages
- water tankers
- other methods as appropriate to the actual situation and designed to meet the duration of the problem.

Impacts of problem can be mitigated in some cases by:

- construction of simple sediment pools to clarify water
- laying of pipe to by-pass a sediment source
- construction of a filter system to clarify water

7.42 Specific Responsibilities for Area "A" (Springer Creek)

7.421 Short Term Planned Sedimentation:
Where impairment of water quantity or quality occurs under short term planned sedimentation situations and where the Contractor is operating either within or outside the conditions of his contract, he shall be fully responsible to fulfill the following commitments.

The contractor shall:

1) give one week notice to the Village of Slocan to allow them to plan for disruption of their operation schedules.

2) be responsible for costs incurred by the Village of Slocan to:

- change from Springer Creek to the Gwillim Creek system
- clean intake dam and pipelines

Where impairment of water quantity or quality occurs under either of Sections:

7.422 Short Term Accidental Sedimentation
7.423 Damage to Intakes
7.424 Plugged Lines

The Contractor shall be fully responsible for fulfilling all of the commitments described in these sections. The Water Management Branch, the Forest Service and the Ministry of Health shall provide technical information and support to help rectify water resource problems. The Contractor shall cooperate with these agencies and licenced water users to facilitate the fulfillment of the commitments described in these sections.

7.422 Short Term Man-induced Sedimentation

The Contractors shall:

1) Provide assistance to the Village of Slocan District to alter their intake system to prevent further sedimentation.

2) Be responsible for costs incurred by the Village of Slocan to:

- change from Springer Creek to the Gwillim system
- extra costs to utilize the Gwillim Creek versus the Springer Creek system

3) Take responsibility for cleaning out the Springer Creek intake pipes and systems

7.423 Damage to Intakes

The Contractor shall fulfill his responsibilities as in Section 7.422

7.424 Plugged Lines

The Contractor shall fulfill his responsibilities as in Section 7.422.

7.43 Specific Responsibilities for Area "B" (Climax Creek, Vincent Creek, Dayton Creek, Silver Bend Creek)

7.431 Short Term Planned Sedimentation

Where impairment of water quantity or quality occurs under short term planned sedimentation situations and where Contractor is operating either within or outside the conditions of his contract, he shall be fully responsible to fulfill the following commitments:

The Contractor shall:

1) Give one week notice to the Water Licensees to allow them to plan for disruption of their home schedules.
2) Provide assistance to users to alter their intake systems to prevent sediment intake where necessary.
3) Deliver water to households for minimum domestic maintenance if the disturbance lasts longer than 48 hours. Irrigation needs are site specific, but normal practices shall be maintained.

If the disturbance lasts longer than seven days, then it is considered a long term problem.

Where impairment of water quantity or quality occurs under either of Sections:

7.432 Short Term Accidental Sedimentation
7.433 Long Term Sedimentation or Pollution
7.434 Plugged Lines
7.435 Damage to Intakes
7.436 Long Term Loss of Flow

The Contractor will be fully responsible for fulfilling all of the commitments described in these sections. The Water Management Branch, the Forest Service and the Ministry of Health shall provide technical information and support to help rectify water resource problems. The Contractor will cooperate with these agencies and licenced water users to facilitate the fulfillment of the commitments described in these sections.

7.432 Short Term Man-induced Sedimentation

The Contractors shall:

1) Deliver water as in 7.431 within 24 hours of cessation of a clean supply

2) Take responsibility for cleaning out intakes, pipes and systems

Water licensees that maintain or operate works that are not capable of handling naturally occurring sediment loads and flow extremes may not be entitled to the commitment described in Section 7.432 (2). Determination of a competent system lies with the Regional Water Manager and is dependent on the situation.

7.433 Long Term Man-induced Sedimentation or Pollution (Longer than 48 hours)

The Contractors shall provide an alternate water supply via the most appropriate means according to Section 7.41 and deliver water to households as in Section 7.431 until such time as the problem has been rectified.

7.434 Plugged Lines

The Contractors shall fulfill his responsibilities as

in Section 7.432

7.435 Damage to Intake

The Contractors shall fulfill his responsibilities as in Section 7.432

7.436 Long Term Man-induced Loss of Flow

The Contractor shall:

1) Provide alternate water sources, and construct and maintain necessary works to meet licenced supplies consistent with normal flow expected from the existing climatic situation.
2) Test alternate supplies for bacterial and mineral quality prior to use.

7.5 PROCEDURE TO ENSURE COMPLIANCE

To ensure compliance with contract conditions and specific responsibilities under Sections 7.42 and 7.43, the Contractors will be required to either post bonds or securities in the amount of $10,000 or provide documentation of an adequate liability insurance policy.

The Government has stated that it will deal with individual cases when they arise having regard to any special circumstances or hardships.

7.6 DETERMINATION OF RESPONSIBILITY

As mentioned, the goal is to have all water related problems solved as quickly as possible and have the determination of responsibility follow the rehabilitative work.

Refer to the contingency plan flow chart to identify the sequence of events in solving an unplanned impairment to water supplies.

If a Contractor is on site, his contact person and the water licensee's contact persons should endeavour to determine the nature of the problem and who is responsible for the impairment and agree upon a procedure to correct it. This shall be done within 12 hours of impairment being reported.

In situations where they cannot agree they shall immediately notify the Water Management Branch, Forest Service, and the Ministry of Health, to request their involvement.

The members of the Technical Review Committee (Section 2.21) shall endeavour to determine responsibility and assist in a procedure to correct the impairment. This should be done within 48 hours of identification of the problem.

Where this group cannot agree, the Regional Water Manager or Engineer will, to the extent authorized under the Water Act, direct the appropriate bodies to take corrective action. The Water Management Branch should make this ruling within 24 hours of being notified of lack of agreement by the Technical Review Committee.

The Water Management Branch would envision utilization of the following sections of the Water Act to address water resource problems.

Section 2 - Vesting water in Crown
Section 7 - Approvals by Comptroller or Regional Water Manager
Section 18 - Licensee (water) to Compensate for damage
Section 20 - Owner to give notice before interfering with works
Section 35 - Power of Comptroller if disobeyed
Section 37 - Powers of Engineer
Section 41 - Offences (under Water Act)

This contingency plan is intended to expedite local solutions to water related problems but does not preclude a private person from pursuing individual legal remedies for damage to water quality or quantity.

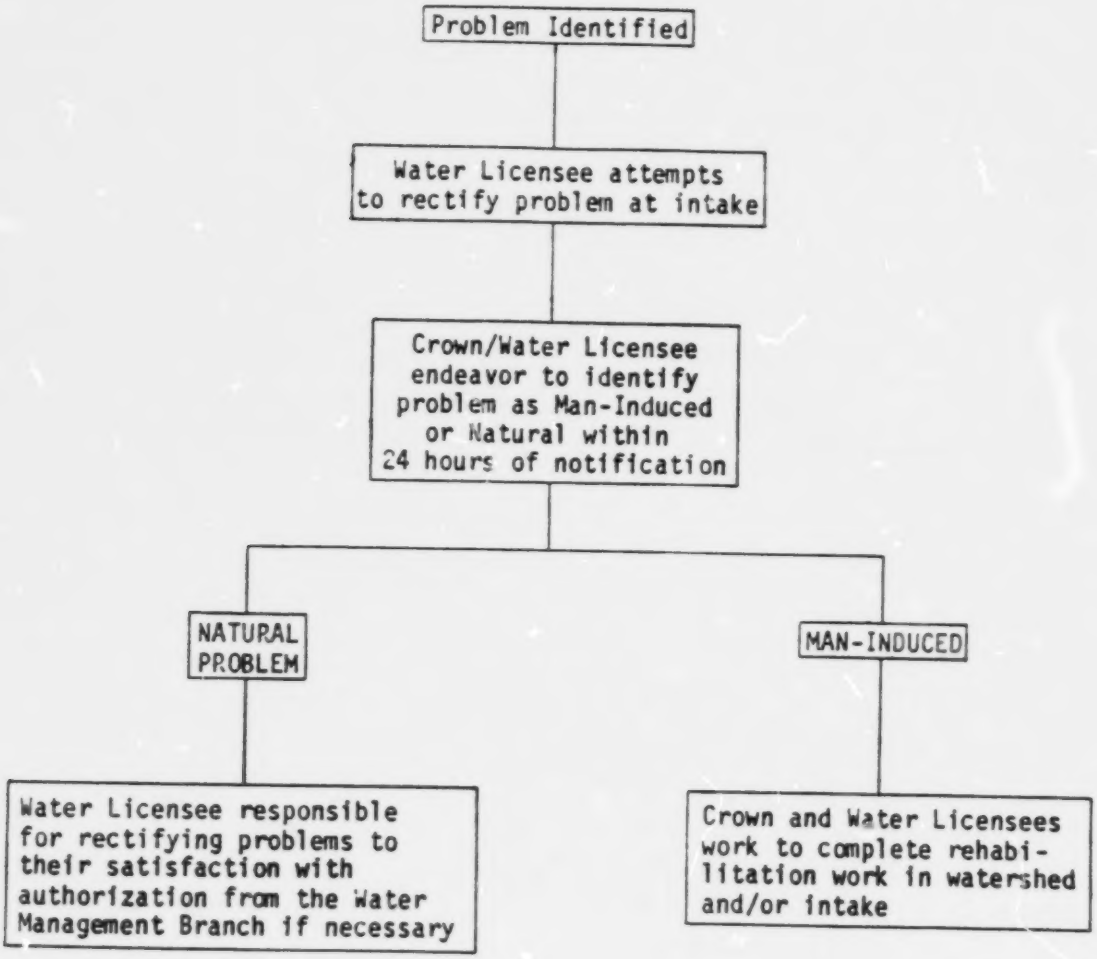
7.7 CONCLUSION

Proper planning and implementation of resource developments will help ensure water related problems are minimized. The contingency plan will assist in dealing with the unforeseen events or mistakes. No guarantees will be made that problems won't occur.

The contingency plan will deal with the existing problem as quickly as possible. However, further follow up on long term problems must also take place. These responsibilities should be identified in the supervision and monitoring step in the planning process.

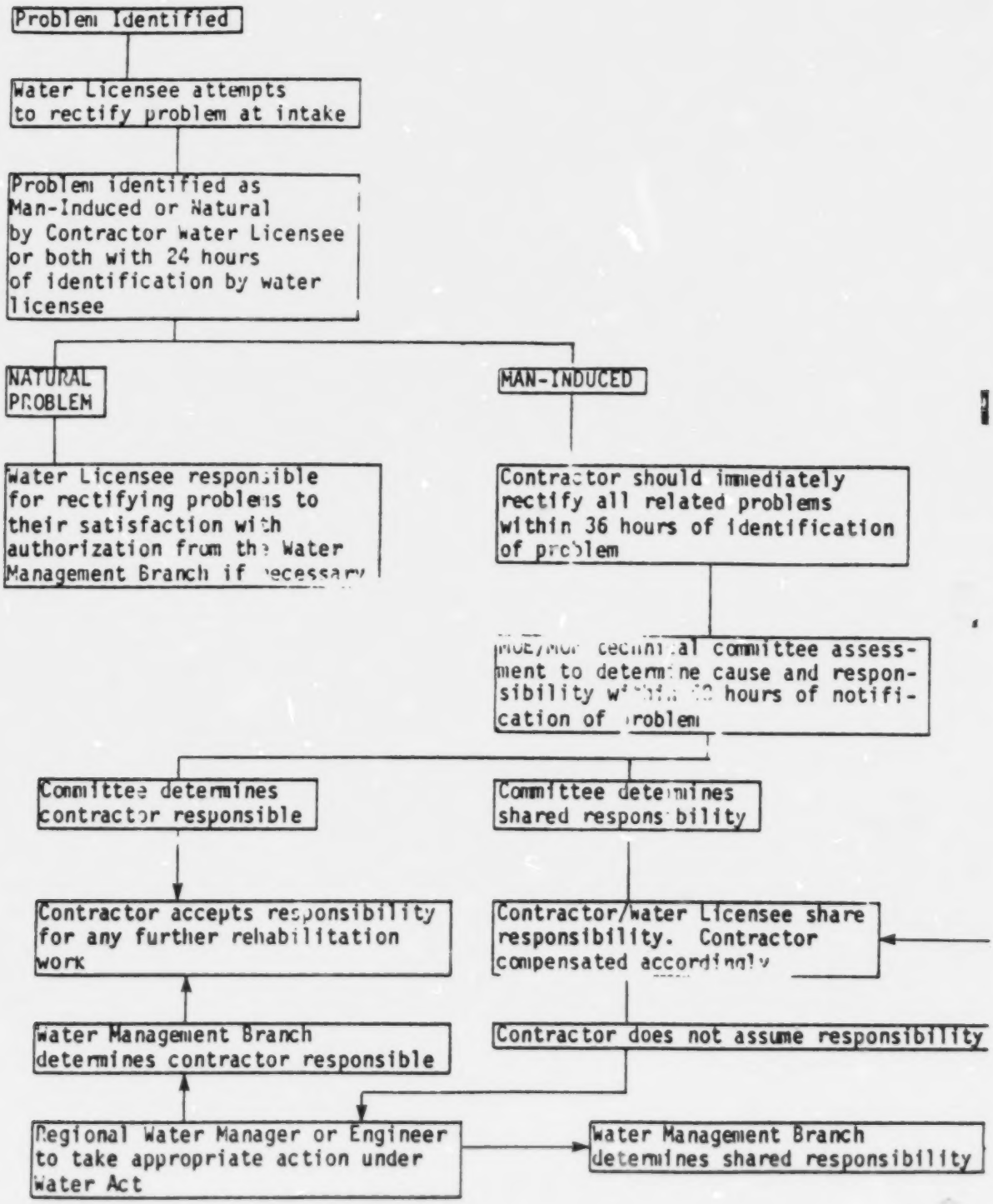
CONTINGENCY PLAN FLOW CHART
FOR UNPLANNED IMPAIRMENT TO WATER SUPPLIES

No Active Operations In Watershed


Problem Identified
Water Licensee attempts to rectify problem at intake
Crown/Water Licensee endeavor to identify problem as Man-Induced or Natural within 24 hours of notification
NATURAL PROBLEM
MAN-INDUCED
Water Licensee responsible for rectifying problems to their satisfaction with authorization from the Water Management Branch if necessary
Crown and Water Licensees work to complete rehabilitation work in watershed and/or intake

:0038p

Active Operations In Watershed


Problem Identified
Water Licensee attempts to rectify problem at intake
Problem identified as Man-Induced or Natural by Contractor water Licensee or both with 24 hours of identification by water licensee
NATURAL PROBLEM
MAN-INDUCED
Water Licensee responsible for rectifying problems to their satisfaction with authorization from the Water Management Branch if necessary
Contractor should immediately rectify all related problems within 36 hours of identification of problem
Committee determines contractor responsible
Committee determines shared responsibility
Contractor accepts responsibility for any further rehabilitation work
Contractor/water Licensee share responsibility. Contractor compensated accordingly
Water Management Branch determines contractor responsible
Contractor does not assume responsibility
Regional Water Manager or Engineer to take appropriate action under Water Act
Water Management Branch determines shared responsibility

*Contractor could be a licensee, permittee or operator depending upon the situatio

8.0 PLAN IMPLEMENTATION IMPACTS

8.1 SOCIAL/ECONOMIC IMPACT

- Implementation of the Springer Creek IwMP will provide a minimum of 193 756 m^3 of wood in the short-term period (1980 to 1999). Harvesting of this volume will contribute to the economy of the Slocan Valley by providing both direct and indirect employment.

- Implementation of the plan will cause some social stress due to industrial operations. It is recognized that some environmental impacts cannot be avoided even though enforcement of existing policies, standards, and guidelines will limit their effect. These effects include:
  - increases in sediment resulting from road construction and harvesting activities,
  - short-term effects on the scenic quality,
  - foregone timber volumes due to the requirement to protect water quality and quantity,
  - reduced air quality due to the combined effects of industrial operations, road traffic and prescribed fire application,
  - increased noise due to industrial traffic.

8.2 RECREATION

Harvesting operations will provide access to alpine/high elevation primitive recreation opportunities.

8.3 VISUAL QUALITY

1) Cut block design will recognize the Retention and Partial Retention Visual Quality Objectives as established along the main Slocan Valley walls.

2) Short-term losses in Visual Quality as a result of harvesting will occur.

8.4 FOREST MANAGEMENT

1) Implementation of the plan will result in a gradual change in that more diverse stands will be created rather than the generally uniform, even-aged forest mosaic now in existence.

2) The stand profile will change gradually. Younger, healthier managed stands will be created.

3) Implementation of the IwMP will provide further access to a vital timber supply, consisting of desirable species of good sawlog quality and in close proximity to an existing manufacturing plant.

4) Implementation of the IwMP will result in the development of capital stock, in the form of roads and managed forest stands, for the long-term benefit of the community.

5) Implementation of the IwMP will result in changes to the Yield Analysis assumption as a result of decisions to forego harvesting opportunities in order to protect water quality and quantity.

6) Implementation of the IwMP will provide clear direction for all resource development.

8.5 WATER QUALITY AND QUANTITY

1) Increasing the kilometers of roads, especially near riparian zones, plus the general impact of timber harvesting and road maintenance may result in water quality effects through increased sedimentation.

2) Increases in water yield will be realized as a result of changes in vegetation cover brought about through harvesting. It is estimated that these will not be sufficient to realize practical benefit. Most additional flow will occur during the spring run-off period when water is plentiful.

3) Impact on the hydrologic values will be reduced by minimizing harvesting activities in riparian zones and by judicious adherence to the implementation techniques.

8.6 WILDLIFE

1) Plan implementation and continued referral with the Fish and Wildlife Branch will provide the opportunity to set aside sufficient mature stands and vegetative diversity to maintain wildlife populations.

2) Wildlife will be impacted by road access and increased hunting pressure.

8.7 FISH HABITAT

Implementation of the IwMP will increase the potential for reducing the quality of fish habitat and will require continued referral to the Fish and Wildlife Branch in order to protect

fish habitat.

8.8 ACCESS

Implementation of the IWMP will provide direction in development of an Access Plan which will address, among other things, road deactivation, maintenance and rehabilitation of sediment sources due to previous access activities.

8.9 WILDFIRE SUPPRESSION

1) Implementation of the IWMP will result in additional access construction which will be beneficial in wildfire suppression.

2) Implementation of the IWMP will increase the risk of fire due to human activities as a result of increased access and industrial activities.

8.10 RISK ANALYSIS

An acceptable level of risk will be subject to area specific requirements. Hydrological evaluation will be performed based first on the management unit plans and later on the operation plans. These evaluations will be carried out immediately after a field location of plan elements: proposed haul roads, harvest unit boundaries, drainage structures, silvicultural and harvest systems. This will allow for orderly, efficient modification of any plan element that is shown inappropriate by the hydrological evaluation. The integrated management plan provides a framework for review of resource uses and specifications of hydrological measures necessary for the short and long term to protect water supplies.

The purpose of the hydrological evaluations is to reach the objective of maintaining or improving water supplies. This will be accomplished by evaluating, analyzing, and making recommendations to operation plans regarding:

- timing of harvest unit patterns
- potential impacts resulting from equivalent clear cut areas being removed
- potential erosion and sediment loading created
- silvicultural and harvest system specifications
- revegetation requirements
- road and drainage structure locations

GLOSSARY

ALTERNATE WATER SUPPLY - water of sufficient quantity, quality and pressure to maintain normal domestic and irrigation practices carried out by licenced water users. The water must meet public health standards if delivered from a source other than the watershed within the planning area.

BED LOAD[8] - the coarser materials, usually mineral (gravel, stones, boulders) moved along the bottom of streams.

BIOGEOCLIMATIC ZONE[6] - a landscape unit within the ecological classification of B. C. describing broad areas of homogeneous climate, vegetation and soils.

CATEGORY 2 WATERSHED[1] - a watershed in which a community holds a water licence and has a drainage area within the range of 6-35 square miles.

CLEARCUT[13] - the cutting method in which the old crop is cleared over a considerable area at one time. Regeneration then occurs from:

a) natural seeding from adjacent stands,
b) seed contained in the slash or logging debris,
c) advance growth, or
d) planting or direct seeding.

CONSENSUS - general agreement arrived at by most of those concerned.

CONSTRUCTION SITE - work area.

CONSULTATION - deliberation between affected parties (Webster's Ninth New Collegiate Dictionary).

GROUP SELECTION[13] - the cutting method in which trees are removed

periodically in small groups resulting in openings that do not exceed an acre or two in size.

INTEGRATE - to form into a whole; to incorporate into a larger unit.

INTEGRATED RESOURCE USE[5] - the deliberate and careful planning of the integration of various resource uses to interfere with each other as little as possible and to complement each other as much as possible, giving due regard to the order of importance of each use in a particular area in an attempt to achieve the optimum social and economic benefit to the people of British Columbia.[5]

LIABILITY the quality or state of being liable or according to law responsible.

MAJOR STREAM CROSSING - crossings on main stems in close proximity to water intakes or private land or sensitive crossings.

PUBLIC INVOLVEMENT - the involvement at the working level of various individuals, groups, corporations or agencies in developing and implementing forest management plans and programs.

REGENERATION DELAY - the maximum time allowed for initial stocking with the minimum number of acceptable trees. The time is measured from commencement of harvesting in growing seasons.

SEED TREE[13] - the cutting method in which the dominant feature is the removal of all trees in one cut except for a small number of seed bearers left singly or small groups.

SHELTERWOOD[13] - the cutting method in which, in order to provide a source of seed and/or protection for

regeneration, the old crop (the shelterwood) is removed in two or more successive shelterwood cuttings. The first cutting is ordinarily the seed cutting and the last is the final cutting.

SINGLE TREE SELECTION[13] - the cutting method in which trees are removed individually, here and there, each year over an entire forest or stand.

STREAM - a natural water course or source of water supply, whether usually containing water or not, ground water and a lake, river, creek, spring, ravine, swamp and gulch (from the Water Act).

10 A.M. CONCEPT - the fire suppression objective to control any wildfire by 10:00 a.m. of the day following detection.

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* These references are noted by superscript in the plan document.

APPENDIX I

SUMMARY OF THE INFORMATION ASSEMBLED AND CONSIDERED DURING THE DEVELOPMENT OF THE SPRINGER CREEK INTEGRATED WATERSHED MANAGEMENT PLAN

1. Plan area identification: watershed area calculation and delineation of sub-unit areas - Refer to Map 4 and Table II.

2. Identification of possible participants
   - Ministry of Energy Mines and Petroleum Resources
   - Ministry of Health
   - Ministry of Highways
   - Ministry of Lands, Parks and Housing
   - Regional District of Central Kootenay
   - licenced water users
   - Village of Slocan
   - Slocan Forest Products Ltd.
   - Brandon Waterworks District
   - MOE - Waste Management
   - MOE - Fish and Wildlife Branch

3. List of user concerns - Refer to Section 3

4. Land status - Refer to Map 2

5. Access - Refer to Map 6

6. Fisheries and Wildlife

   - Canada Land Inventory (CLI) - information outlining habitat capability
   - Slocan Valley Plan - F & W technical report
   - detailed referrals are conducted at the silvicultural stage and are available on cutting permit files

7. Timber

   Resource objectives are outlined in:
   - Arrow TSA yield analysis (1981)
   - Arrow TSA Plan (1985)
   - timber type information including operability, ESA areas is available at scales of 1:20 000 1:50 000
   - Slocan Forest Products Ltd. 5-year Development Plan 1986-1991

8. History

   - 1:20 000 inventory maps outline current history

9. Water licencing information

10. Soils

- Soil Resources of the Nelson Map Area, RAB Bulletin #20
- Biophysical Resources of the Slocan Valley, APD Bulletin #28
- Detailed terrain analysis, Forest Service Nelson Region

11. Visual Resource

- Visual Quality Objectives (VQO's) as contained in "Slocan Valley Development Guidelines", 1984

12. Recreation
- MOF Recreation Inventory

13. Topography

- 1:50 000 scale contour map
- 1:10 000 maps are available for some individual sub-units

14. Insects and Disease

- reconnaissance information and mapping of susceptible types completed by the MOF

15. Biogeoclimatic information

- Biogeoclimatic zones - Refer to Map 3
- Ecosystem Management interpretations and biogeoclimatic zone characteristics are described in the "Ecological Classification for the Nelson Region" (3rd approximation). Site specific prescriptions are made utilizing the classification guidelines.

16. Inventory Needs

The drainage has been divided into sub-units. As development occurs on these areas (e.g. sub-unit 1 - Dayton Creek) additional data needs are identified. Inventory requirements and survey intensity levels should be geared to specific concerns and required decisions for each sub-unit within the Springer Creek watershed.

An identical data base in all sub-units will not be necessary. The data should be specific to the decision to be taken.

APPENDIX II

CHRONOLOGY OF THE EVENTS AND ACTIVITIES FOR THE DEVELOPMENT OF THE SPRINGER CREEK INTEGRATED WATERSHED MANAGEMENT PLAN

1. Events general to the Arrow Timber Supply Area (TSA)

   - 1981

     The Arrow TSA Yield Analysis Report was presented for public review at meetings throughout the Arrow TSA. The report discussed various harvesting scenarios.

   - 1985

     The Arrow TSA Plan was presented for public review at meetings throughout the Arrow TSA. The report outlined various processes to be employed in the resolution of resource use conflicts.

2. Events specific to Springer Creek

   - 1983

     Letter from the Village of Slocan to Ministry of Forests re road construction.

   - 1983

     Letter from the Village of Slocan to Ministry of Forests requesting a copy of all cutting permits.

   - 1983

     Ministry of Forests communication.

   - 1984

     Ministry of Forests response to Ministry of Environment (Water Management Branch) and Village of Slocan re road problems. The letter concluded that the old (40 years) mining road to Ottawa Hill is the primary source of siltation into Springer Creek.

   - December 30, 1983

     Slocan Forest Products Ltd. submitted their initial 5 year Development Plan for Forest Licence A20192.

     The plan has been reviewed by the Arrow District Office and Fish

and Wildlife Branch. Modifications were requested and made, but a final plan has not been approved. The Dayton Creek area is part of the licensee's five year wood supply.

- February 28, 1984

Initial notification by Slocan Forest Products Ltd., to the Arrow District Office, indicating the company's intent to develop the Dayton Creek area. At that time Slocan Forest Products Ltd. obtained water licencing information from the Ministry of Environment office. Utilizing this data, the company advised water users of their plans to pursue approval for harvesting.

- March 20, 1984

The Arrow District Office received a letter from Mrs. F. Davis (water user) requesting clarification of notice she received from Slocan Forest Products Ltd.

- March 23, 1984

Internal referral sent to Ministry of Forests' Program Managers (Silviculture, Protection, Engineering, Range and Recreation, Inventory) requesting comment on Slocan Forest Products Ltd. notice of intent to develop the Dayton Creek area.

- April 6, 1984

Letter sent to Mrs. Davis by District Manager - Arrow advising that Slocan Forest Products Ltd. had completed an initial recce of the area of interest and assuring that water users will have an opportunity to review all information.

- April 9, 1984

Referrals sent by Arrow District to Water Management Branch and Fish and Wildlife Branch requesting specific information and input.

- April 30, 1984

Internal referral comments reviewed including comments regarding road construction, cutting plan, and visual impact.

- May 14, 1984

The Arrow District advised Slocan Forest Products Ltd. that final approval would not be forthcoming until the approval of the Slocan

Valley Plan. (Note: Indications, at that time, were that plan approval would be received by mid-June. When it became evident that the plan would not be approved in the foreseeable future, the Arrow District made the decision to proceed).

- May 23, 1984

Slocan Forest Products Ltd. provided the Arrow Forest District office with the information the company received from Water Management Branch, i.e. licencing information, location of POD's, etc.

- June 11, 1984

Referral comments received from Water Management Branch and Fish and Wildlife Branch as per Ministry of Forests' request of April 9, 1984.

- July 7, 1984

Ministry of Forests provided Slocan Forest Products Ltd. with the landscape visual sensitivity ratings.

- July 10, 1984

Ministry of Forests and Slocan Forest Products' staff field reviewed information provided to date. Proposed road access was reviewed. General development guidelines regarding block design, silvicultural options were discussed.

- July 18, 1984

An informal meeting was held at the Davis residence with some of the water users, Slocan Forest Products' staff, Ministry of Forests staff from the Nelson Regional Office and Arrow District Office.

- July 23, 1984

A formal meeting was held at Slocan Forest Products Ltd.'s office with available water users, the Slocan Valley Watershed Alliance representatives, and Ministry of Forests' representative. In response to the question: Is the Ministry of Forests following Appendix 4 of the Slocan Valley Development Guidelines?, the reply was given that Appendix 4 was generally being followed, but that this area did not warrant the extensive data collection required in other areas. At the meeting a request was made to allow Mr. A. Salway access to private land in order to determine the location of water intakes. Slocan Forest Products Ltd. agree to provide copies of Mr. Salway's report when completed. It was agreed that Mr.

Salway would complete his report and that Slocan Forest Products Ltd. would proceed with a silvicultural assessment and timber cruise of the area. All information would be reviewed with the water users.

- July 26, 1984

Slocan Forest Products Ltd. submitted a cruise and silvicultural assessment plan for the entire Dayton Creek slope.

- August 1, 1984

A field trip held to review tributaries of Vincent Creek; follow gullies to main flow of Vincent to POD's of Scannel and Davis. Attended by D. Wickstrom, T. Salway, B. Ross and B. Scannel.

- August 3, 1984

The cruise and silvicultural plan layout were approved by the Ministry of Forests.

- August 16, 1984

Mr. A. Salway's report was submitted. The report, among other things, stated that the proposed development is "extremely unlikely" to affect the Vincent Creek watershed area. (Note: Vincent Creek represents the only stream channel which supplies continuous domestic water).

- September 27, 1984

Slocan Forest Products Ltd. submitted their application for a Road Permit to construct. The application was reviewed by the Arrow District.

- October 19, 1984

Slocan Forest Products Ltd. submitted their completed silviculture and cutting plan for the Dayton Creek slope. The plan was circulated, both internally and externally, for comments.

- October 20, 1984

Slocan Forest Products Ltd. notified all licensed water users of a meeting on October 30, 1984 at the company office. The purpose of the meeting was to discuss the proposed road construction and cutting plan.

- October 30, 1984

The Ministry of Forests attended the meeting at Slocan Forest Products Ltd.'s office. No members from the public attended.

- October 31, 1984

The Ministry of Forests advised all licensed water users that permission to construct road will be given to Slocan Forest Products Ltd. Invitation to accompany Ministry of Forests' staff on regular inspections was extended. Names of contact persons were given. The public was also advised that a further meeting will be called, subsequent to review of the company's silviculture plan.

- November 1, 1984

This is the effective date of the Road Permit issued to Slocan Forest Products Ltd. The permit outlines the conditions/standards applicable.

- November 6, 1984

Slocan Forest Products Ltd. commenced R/W logging.

- June 1, 1985

Ministry of Forests and Ministry of Environment adopt, as policy, the documented framework for "Integrated Watershed Management Plans" as described in Appendix H of Guidelines for Watershed Management of Crown lands used as Community Water Supplies.

- June 21, 1985

A letter from the Village of Slocan was received indicating that the SVWA will represent the Village from now on. The reply from the MOF indicated that the Ministry would continue to involve water users.

- July 16, 1985

Request by Village of Slocan for a meeting.

- September 30, 1985

Meeting with the Village of Slocan and SVWA was held; verbal reply was given; 1 to 2 briefs submitted that evening.

- October 21, 1985

A written reply to concerns was made by the MOF.

- November 6, 1985

  Slocan Forest Products Ltd. submitted a final cutting permit application and final cutting plan.

- November 28, 1985

  A written reply to concerns was made by the MOE.

- March 10, 1986

  Reply by Forests' Minister Jack Heinrich, to Village of Slocan letter expressing concern relative to CP 46, Dayton Creek. Minister indicated that "a planning process is in place which has been adopted by the Ministry of Environment and the Ministry of Forests ... the decision making agencies in these matters".

- July 16, 1986

  Draft copies of the Springer Creek IWMP distributed to principal participants and made available to licensed water users for review and comment. All parties invited to participate in a discussion of all submissions on August 20th.

- August 20, 1986

  Meeting at Arrow Forest District Office Castlegar to discuss written comments from the Village of Slocan, Slocan Forest Products Ltd., District Manager Arrow Forest District and Planning Section Nelson Forest Region. Attended by MOF Arrow District (R. Augustin, T. Evans), MOF Nelson Region (K. Milner), MOE (K. Gorsline), Slocan Forest Products (D. Wickstrom, T. Dods), Village of Slocan (B. Barclay, G. Perriere).

- August 20, 1986

  Resubmission of final plan for Blocks 1 and 2, CP 46, Dayton Creek by Slocan Forest Products.

- August, 1986

  Aerial surveys by MOF and Slocan Forest Products to assess current blowdown and Mountain Pine Beetle activity within Springer Creek and adjacent drainages.

- August 26, 1986

  MOE/MOF written responses to review comments from the Village of Slocan and Slocan Forest Products.

- August 28, 1986

  Receipt of written comments from MOF Regional Hydrologist (Dave Toews).

- September 9, 1986

  Field inspection of specific sites regarding branch roads accessing portion of CP 46, Dayton Creek. Attended by MOF (R. Augustin, T. Evans), MOE (K. Gorsline), Slocan Forest Products (D. Wickstrom, J. Vingo), A. Salway (Consultant).

- October, 1986

  Completion of revised Springer Creek IWMP document incorporating many recommendations from written comments.

- October 22, 1986

  Copy of revised Springer Creek IWMP sent to Slocan Valley Watershed Alliance for review and comment.

- December 8, 1986

  Presentation by the Slocan Valley Watershed Alliance of their written review of the Springer Creek IWMP.

- December 23, 1986

  MOE/MOF written response to SVWA review of the Springer Creek IwMP.

- January, 1987

  Proposed final Springer Creek IwMP document incorporating some suggested amendments from the SVWA written review and from Ministry of Environment and Parks legal counsel written review.

- February/March, 1987

  Review of proposed final Springer Creek IwMP by plan participants.

- March/April, 1987

  Written comments received from Slocan Forest Products Ltd., SVWA and Ministry of Health.

- May, 1987

  Preparation of final Springer Creek IwMP document. District Manager, Arrow Forest District and Regional Director, Environment and Parks approve Springer Creek IWMP.

APPENDIX III

MINISTRY OF FORESTS PROCEDURE FOR PROCESSING CUTTING PERMITS

STEP #1 - APPLICATION FOR CHART AREA

1) Covering letter containing:

- statement of mature volumes
- statement of Licensees position in regards to number of years cut held under chart
- additional reasons for processing of chart and the priority

2) Map showing:

Basic Map Legend Information
- Scale of 1:20 000
- Tenure (Licence)
- TSA and Supply Block
- PSYU
- Forest Region, Forest District
- Land District
- Region, Compartment
- NT and UTM grid
- Licensee
- North Arrow or direction designation
- Surveyed Lots
- Title or Purpose of Map

STEP #2 - FOREST LICENCE BASIC DEVELOPMENT (OPERATING) PLAN OUTLINE

TITLE PAGE

1.0 TIMBER

1.1 Harvesting

1.11 Cutting Schedule

1.12 Engineering
1.121 Existing Development
1.122 Proposed Development

1.13 Planning

1.14 Cruising and Scaling

1.2 Silviculture

1.21 Basic
1.22 Intensive

1.3 Protection

1.31 Fire
1.32 Pests

2.0 RANGE

3.0 RECREATION

4.0 PROVISION FOR INTEGRATED RESOURCE MANAGEMENT

5.0 SPECIAL PROJECTS

6.0 REVISION

7.0 APPENDICES

I Development Map(s)
II Cost Estimate Summary (Section 88)
III Operational Schedules

STEP #3 - SILVICULTURAL REPORT AND PROPOSED CUTTING PLAN MAP

1) Complete forms F.S. 711's A&B

2) Submit written report as follows:
- Location - drainage, relationship to physical features, other permits
- Topog - slope, aspect, terrain, principle features
- Soils - Type, depth, moisture, Bio - geo climatic zones, rock outcrop, anticipated erosion problems.
- Stand description
  - sample data, preliminary cruise plots
  - timber types
  - species composition
  - understory
  - immature
  - volume estimate
  - percent crown closure
- Stand condition
  - pathological and entomological defects
  - vigor

- incidence of blowdown, snags, etc.
- tree forms

- Logging chance
  - cost compared to norm
  - stump to truck logging system best suited
  - problems - road construction and logging
  - best logging season
  - haul distance and destination
- Road construction - (all roads)
  - how much and what class
  - type of drainage structures
  - whether roads develop other areas
  - relative construction costs compared to norm
  - alternative access
  - season of construction, season of use
- Watershed
  - description of watershed sub-unit that application is within
  - projection of affect of logging on watershed values
  - efforts that will be made to protect existing watershed values
- Recreation and Visual Landscape Management
  - present values and uses
  - future use and potential
- Wildlife and Fisheries
  - present values and uses
  - future use and potential
  - assessment of effect of recommended management prescriptions
- Public Involvement
  - list of potential participants
  - existing public involvement
  - information needs
- Recommendations
  - point by point description of what the licensee proposes to do
  - proposals for cutting specs, slash disposal and reforestation techniques
  - reserve proposals

3) Silvicultural Map
   - legend - refer to Step #1 point 2 for basic legend requirements
   - photo numbers and flight lines
   - timber types
   - topographic and physical features
   - drainage features
   - tie points, strips, plot locations, direction of travel during examination
   - problem areas, insects, disease, blowdown, wet or rocky ground
   - reserve areas (recreation, ecological, streamside, etc.)
   - proposed cut block boundaries and sizes

   Note: Contour lines are not required nor desired on this map

4) Proposed cutting plan map
- legend - refer to Step #1 point 2 for basic legend requirements
- proposed cut block boundaries (it is not necessary to have cut block boundaries laid out in the field at this stage).
- proposed cutting permit boundaries
- proposed road and landing locations. Main roads must be laid out on the ground. Landing locations along main roads must be identified on the ground. All roads and landings must be shown on the map and given a reference number.
- type, location and size of major drainage structures
- reserves, particularly machine buffer. (not necessary to be located on the ground).
- planimetric base (Lots, etc.)
- history (existing roads, cut areas, etc. within or adjacent to the cutting permit area)
- contour lines - (50 m, referenced every 5th line)

Copies required - 4 of each (Forms FS 711A, 711B, written silvicultural report, silvicultural map and proposed cutting plan map)

STEP #4 - CRUISING PLAN

1) Complete form NF 146

2) Cruising Map
- basic legend information (Refer to Step #1, point 2)
- tie points for strips
- proposed strip locations
- proposed plot locations
- identify type plot - (fixed radius, variable)
- cut block boundaries (field location not needed)
- timber types
- drainage features
- reference numbers on cruise strips and plots

Copies required - 2 forms, 3 maps

Note: Cruising must be carried out in accordance with the Provincial Cruising Manual.

The licensee will be required to submit the cruise cards and 2 copies of a cruise map based on actual field notes, on completion of cruising.

Standardized Paint and Ribbon Colours

Block Boundaries
- Boundaries shall be marked with a single blaze facing area of cutting. OR

  Paint marking of boundaries shall be done with orange paint applied as a single horizontal line. Orange ribbon is used on all boundaries.

Cruising Baselines
- Baselines shall be marked, with a single blaze facing along the line on each side of trees. Where flagging ribbon is used the colour to be used must be based on whether the baseline is within the sale area or whether it forms a boundary. Baselines within the sale area shall be marked with blazing and blue ribbon. Baselines forming an external boundary of a sale shall be marked with orange ribbon and blazing.

Cruising Strip Lines
- Blue ribbon

Cruising Plots
- Orange and blue

Road Location and Landings
- Yellow and Flourescent Pink Ribbon

Tree Marking
- Yellow paint for leave trees and seed blocks

STEP #5 - FINAL CUTTING PLAN

1) Cutting permit application covering letter

2) Cruise print out and completed log position summary form (NF 150)

3) Field Data and Appraisal Summary (NF 958)

4) RPF signed and sealed FS 1072

5) Cutting plan map
   - Basic legend information - (see Step #1, point 2)
   - Cutting permit boundaries
   - Final cut block boundaries and block reference numbers (block boundaries must be located on the ground and traversed prior to this submission. Use paint, or blazes).
   - Final road and landing locations (located on the ground, traversed and referenced). Landings must be numbered.

- Kilometer reference on main road
- Type, location and size of drainage features and structures
- Reserves (creek, machine, recreation, ecological, etc.)
- Planimetric base
- Contour lines - 50 m, referenced every 5th
- History (roads, cut blocks, etc.)
- Skid trail location
- Logging sequence
- Indication of wet areas
- Season of Logging

Copies required - 2 of written, 4 of maps

Map scale of 1:20 000 scale of 1:10 000 on areas specifically requested

GUIDELINES FOR STEP #6 (OPERATIONAL LOGGING PLAN)

The logging plan must ensure that all contract conditions will be met and methods of harvesting are initiated to ensure attainment of the silvicultural objectives.

1) Covering letter

2) A map with the following standards:
   - Basic legend information
   - Landings numbered in the field and on the map
   - Location of skid trails (when requested) and direction of skid
   - Immature areas
   - Reserves (creek, machine, etc)
   - Roads
   - Cut block boundary
   - Contour lines, referenced every 5th

   One map per block unless otherwise approved by Resource Assistants.

3) Detailed Logging Plan Write-up:
   - season of logging
   - block sequence
   - block boundaries blazed or painted
   - special considerations such as deer bedding grounds, specialized equipment, logging contractors

APPENDIX IV

LIST OF TABLES

Table I - Implementation Steps for a Systematic Approach to Integrated Watershed Management Planning
Table II - Sub-Unit Harvesting Summary
Table III - Water Licencing Information
Table IV - Harvested Volumes (1980 - 1985)
Table V - Erosion Hazard Chart
Table VI - Silviculture Summary

Table I

IMPLEMENTATION STEPS FOR A SYSTEMATIC APPROACH TO INTEGRATED WATERSHED MANAGEMENT PLANNING

Step 1	Commence Planning Process and Initial Information Assembly	Initiate Planning of Watersheds in the context of ongoing planning and management.
Step 2	Inventory and Data Verification	Identify concerns Inventory at Landscape Unit Scale (e.g., 1:50 000 to 1:20 000)
Step 3	Analysis and Evaluation	Evaluation of relevant data including: Ecological data, watershed sensitivities, economic feasibility, silviculture, etc. Water user and delivery system information Statement of management objectives Fill data gaps Formulate alternatives where required
Step 4	Decisions at the Landscape Unit Scale	Evaluate alternatives Delineate sensitive areas and areas not suitable for logging Identify areas for further analysis Develop management guidelines and performance standards Develop contingency plan
Step 5	Commence Operational Inventory and Analysis	Analysis at Operational Level (1:20 000 and larger) of: Priority sensitive areas Detailed silviculture, cruise, logging, access development, harvest schedule, water supply and distribution systems, etc.
Step 6	Decisions at the Operation Unit Scale	Delineate sensitive areas and areas not suitable for logging Refine performance standards Finalize detailed harvesting plans and other requirements and Finalize contingency plan Endorsement by Forest Service and Ministry of Environment
Step 7	Plan Implementation and Monitoring	Implementation and Monitoring Logging proceeds with: Performance standards in contracts and permits Supervision and monitoring Post-harvesting operations

Table I is consistent with Appendix H of 'Guidelines for Watershed Management of Crown Lands Used as Community Water Supplies' and Appendix 4 of the 'Slocan Valley Development Guidelines' entitled 'Slocan Valley Integrated Watershed Planning Process'.

TABLE II

Sub-Unit	Area (ha)	% of Springer Watershed Area	Ha logged to date	% of Sub-Unit Area Harvested	Area Proposed for Harvest	Est. of FUTURE DISTURBANCE for remaining units	% of Disturbance of Sub-Unit (Proposed & Existing)
I	1100	20.8	14	1.3%	120 ha (CP 46)	--	12.2%
II	820	15.5	0	0%	-	137 ha	16.7%
III	1450	27.4	111	7.7%	-	--	7.7%
IV	1500	28.4	345	23.0%	0	138 ha	32.2%
V	420	7.9	23	5.5%	0	--	5.5%
TOTAL	5290	100	493	10.7%	120 ha	275 ha 120 395	16.8%

NOTE: Does not include roads outside of harvesting areas

Refer to Map IV for sub-unit boundaries

TABLE III - WATER LICENSING INFORMATION

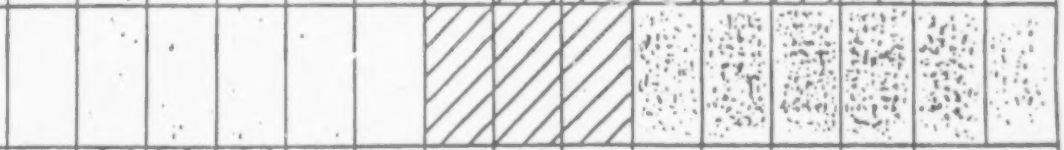
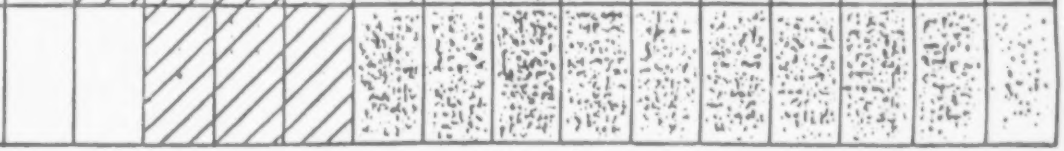
LICENCE	LICENSEE	DEMAND	PURPOSE
Springer Creek Main Stem			
C.L. 28412	Village of Slocan	100,000 g.p.d.	Waterworks
C.L. 49180	Eric Winje	500 g.p.d.	Domestic
C.L. 51524	Brandon Waterworks District	12,500 g.p.d.	Waterworks
C.L. 51677	Thomas Coyle	3.75 ac.ft./annum	Irrigation
	TOTAL DEMAND	113,000 g.p.d.	Domestic
		3.75 ac.ft.	Irrigation
Springer Creek Tributaries			
Dayton Creek C.L. 51764	Northo Properties Ltd.	100,000 g.p.d.	Mining
Silver Bend Creek C.L. 38263	Henry Marasek	1,000 g.p.d.	Domestic
Climax Creek			
C.L. 51527	Brandon I.D.	12,500 g.p.d.	Waterworks
C.L. 51764	Thomas Coyle	1,500 g.p.d.	Domestic
	TOTAL DEMAND	14,000 g.p.d.	Domestic
Vincent Creek			
C.L. 53340	Evelyn Hurst	500 g.p.d.	Domestic
C.L. 29514	Max Davis	500 g.p.d.	Domestic
		10.00 ac.ft.	Irrigation
C.L. 44614	Davis Smith	500 g.p.d.	Domestic
		1.25 ac.ft.	Irrigation
C.L. 44615	Eric Winje	500 g.p.d.	Domestic
		10.00 ac.ft.	Irrigation
C.L. 51444	Max Davis	500 g.p.d.	Domestic
C.L. 54241	Clarence Thickett	500 g.p.d.	Domestic
	TOTAL DEMAND	3,000 g.p.d.	Domestic
		21.25 ac.ft.	Irrigation

TABLE IV - HARVESTED VOLUMES (1980 - 1985)

Since 1980, the following volumes (in cubic meters) have been harvested:

YEAR	Ba	Ce	F	He	Lw	Pl	S	Pw	Pa	Py	Hz	
1980						Nil						
1981	3421.1	1177.4	2003.0	1636.2	669.0	11054.7	4003.9	1059.9	22.1	20.4	25.5	25901.2
1982	1032.9	2742.0	2724.5	3522.5	560.5	5723.5	3423.9	1733.5	0.8	3.0	--	21467.1
1983	3358.5	3480.9	10720.7	3568.9	1170.3	19990.1	4745.4	2352.2	20.5	208.7	--	49624.2
1984	47.9	119.5	-75.5	165.6	176.3	-75.8	206.7	153.8	--	-10.3		708.2
1985	1390.3	917.3	462.7	1231.1	201.4	14062.0	3326.8	470.3	--	7.2		22877.1
												120577.8

TABLE IV EROSION HAZARD CHART

TEXTURE	MATERIAL	SLOPE % 5 10 15 20 25 30 35 40 45 50 55 60 65 70
COARSE	SANDY GRAVELS, GRAVELLY SANDS, GRAVELS	
MODERATELY COARSE	SAND, LOAMY SAND, SANDY LOAM, FINE SANDY LOAM, GRAVELLY SANDY LOAM, GRAVELLY LOAMY SAND	
MODERATELY FINE	LOAM, SILT LOAM, SILT, SANDY CLAY LOAM, CLAY LOAM, SILTY CLAY LOAM	
FINE	SANDY CLAY, CLAY, SILTY CLAY, HEAVY CLAY	

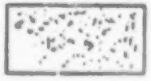
EROSION HAZARD : SEVERE  MODERATE SLIGHT

TABLE VI - SILVICULTURE SUMMARY

The following summarizes the silviculture activity undertaken and/or planned. Information is presented by mapsheet by opening.

	RESP.	YR LOGGED		PRESENT STATUS	AREA	CURRENT STOCKING	TOTAL STOCKING		SCHEDULED FOR PLANTING
F074 #233	B.C.F.S.		C/C	NSR	24 ha	42 well spaced st/ha (S)	575 st/ha	Brush with SB vets. Area is scheduled for a recce 1986 to update status & determine treatment needed.	Re-log, burn and plant not scheduled
F083 #13	Slocan	1976	C/C	NSR	9 ha	453 well spaced stems/ha (B,S,Pl)	1053 st/ha		1988
F083 #12	Slocan	1976	C/C	NSR	44 ha	628 well spaced st/ha (B,S)	2121 st/ha	Resurvey 1989	
F073 #13	B.C.F.S.	ESP-MCBR-P	C/C	SR	18 ha	1000 well spaced st/ha (F) (Aspen)		Scheduled for free-to-grow survey 1987	
F073 #11	Slocan	1977	C/C	NSR	38 ha	1530 well spaced st/ha (Pl, S)		Broadcast burned 1979. Scheduled for regen survey 1986. No previous survey info	Planted 1986
F073 #12	Slocan	1977	C/C	NSR	48 ha	591 well spaced st/ha (B,Pl,S)	1686 st/ha (B,Pl)	Regen surveyed 1982 & 1985	1988
F074 #230	Slocan	1977	C/C	NSR	43 ha	442 well spaced stems/ha (Pl,B,S)	2161 st/ha (Pl,B,S)	Regen surveyed 1983 and 1985	1988

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	RESP.	YR LOGGED		PRESENT STATUS	AREA	CURRENT STOCKING	TOTAL STOCKING		SCHEDULED FOR PLANTING
F073 #22	Slocan	1979	C/C	NSR	14 ha	738 well spaced st/ha (F B Pw)	2250 st/ha	Regen surveyed 1983. Scheduled for regen survey 1991	
F073 #23	Slocan	1979	Select	NSR	22 ha			Landings burned 1983. Regen survey scheduled 1986. No previous survey info.	
F073 #24	Slocan	1979	C/C	NSR	6 ha	813 well spaced st/ha (B,F)	2427 st/ha (B Pw F)	Spot burned 1980. Regen surveyed 1983 & 1984. Scheduled for a Regen survey 1990	
F073 #25	Slocan	1979	Seed Tree	NSR	5 ha	880 well spaced st/ha (F,Pl,Pw)	3173 st/ha (Pl,Pw,F)	Regen surveyed 1985 Scheduled for regen survey 1989	
F073 #26	Slocan	1979	Select	4ha SR 25ha NSR		591 st/ha well spaced (F,Pw,Pl)	1991 st/ha (F,Pl,Pw)	Scheduled for site prep by hand. Regen surveyed 1982 & 1985	Planting spots 1986 - plant 1988
F073 #27	Slocan	1981	Seed Tree	NSR	11 ha	733 well spaced st/ha (B,Pl)	2360 st/ha (B,Pl,F)	Regen survey 1985 Scheduled planting prescription survey 1986	
F073 #28	Slocan	1981	Seed Tree	NSR	13 ha	713 well spaced st/ha (B,F,Pw)	2467 st/ha (B,F)	Regen surveyed 1985 Scheduled for regen survey 1989	
F073 #29	Slocan	1980-1983	Seed Tree	NSR	43 ha	393 well spaced st/ha (F,Bl,Pl)	1179 st/ha	Spot burned 1983. Scheduled for regen survey 1989	

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	RESP.	YR LOGGED		PRESENT STATUS	AREA	CURRENT STOCKING	TOTAL STOCKING		SCHEDULED FOR PLANTING
FU74 #231	Slocan	1980-1982	Seed Tree	NSR	20 ha	100 well spaced st/ha (S,Pl,F)	1870 st/ha (B,S,P)	Regen surveyed 1985. Scheduled for planting survey 1987	1988
FU74 #229	Slocan	1981-1982	Seed Tree	NSR	32 ha	145 well spaced st/ha (F,Bl,Pl)	511 st/ha	27 ha broadcast burned 1983.	1988
FU74 #228	Slocan	1982-1983	Seed Tree	NSR	54 ha	154 well spaced st/ha (Bl,Pl,Se)	703 st/ha		1988
F083 #9	B.C.F.S	1981	Seed Tree	NSR	13 ha	296 well spaced st/ha (B,Pl,S)	2480 st/ha (B,Pl,S)	Regen surveyed 1985. Scheduled for planting survey 1987	
FU74 #232	S.F.P.	1985	C/C	NSR	34 ha	69 well spaced st/ha (B)	350 (B)		1988
FU74 #239	S.F.P.	1985	C/C	NSR	27 ha			Regen survey scheduled 1989	

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MAPS NOT

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